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FRUITS

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PREFACE

If there is any food that is good for health but is not disliked, it must be a fruit of some kind. Thus fruits have an important role in the dietaries of any people. This compilation provides interesting and useful information on some 15 nutritious fruits of India. Their nutritive value, history, botanical nomenclature, some cultural practices are given. Most of the articles have earlier appeared in NUTRITION the quarterly published by the Institute. However some additional information has been provided and several articles have been rewritten for this compilation by Miss Indira Gopalan of the Extension and Training Division of the Institute. Recipes based on fruits are also indicated in the Appendix. This book is sure to be popular among the general public and scientists alike. Housewives, home science students, extension workers and many others will find this booklet useful.

National Institute of Nutrition
Hyderabad — 500 007, India.

P.G. Tulpule
Director

February 1983.



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INTRODUCTION

Fruits seem to be a food that have been enjoyed by mankind from the very earliest of times. Perhaps the first food that prehistoric man ate was a fruit of some kind. Even the story of man begins with the forbidden fruit in the Bible.

In Indian mythology there is a story associated with almost every fruit. Most Indian children can recall the story of how Lord Ganesha and his brother Kartikeya fought over the celestial Mango. The fable of the Fox and Sour Grapes is equally popular. From ancient times, the kings and rulers have patronised fruit orchards. Old sculpture and art abound with depiction of a variety of fruits. Scientifically speaking, fruits encompass many foods usually classified as vegetables, fruits, nuts, berries, grains, legumes even cereals and some spices. However when we say fruit, we usually mean the fleshy, pulpy, moisture laden product, full of aroma and flavour unlike the nuts, legumes and cereals which are dry.

Botanically, fruits are the matured ovary of a plant with accessory parts. It is the succulent, pulpy, edible substance covering the seed of flowering plants and trees. Because of this, anything that is fertile and productive is often referred to as fruitful. Strictly speaking it is very difficult to say why any one item is classified as a fruit or a vegetable. Generally, vegetables are mature fruits which are not sweet or acidic.

Fruits contain abundant quantities of sugar. Fruit starch is usually changed into sugar upon ripening. The important fruit sugars are fructose, sucrose, dextrose, glucose etc.

In terms of nutrition, fruits are very good sources of several vitamins, mineral salts and dietary fibre all of which are essential for good health. Nutrition scientists advocate the intake of some fruits in the daily diet. They are health promoting as well as pleasure giving. Of course, when compared to several other foods, fruits contain lesser amounts of nutrients and they can be expensive too. However, in the season when they are plentiful, fruits can surely enrich the diet of almost every one.

Fruits are generally very efficient sources of vitamin C. An average of 100 g. of mixed fruit can give an adult his daily vitamin C requirements. It is well recognised that vitamin C protects against scurvy. This vitamin also has other attributes such as helping in improving resistance to infection and protecting against bleeding gums. The fruits which are good sources of vitamin C include the Guava, Sitaphal, Amla, Citrus etc.

The yellow and deep orange coloured fruits are excellent sources of beta-carotene the precursor of vitamin A. This essential nutrient protects the person from nutritional blindness. The Mango and Papaya are some of the best and least cost sources of this important vitamin. The Tomato, Orange, Muskmelon, Roseapple and Cape gooseberry are also fairly good sources of carotene.

Fruits generally do not contain large amounts of vitamin D. However, some are fair sources of vitamins of the B-complex family. These include Banana, Sithaphal, Pineapple, Cherimoya & Raisins. Most of the essential minerals such as calcium are found in fruits like Sithaphal, Citrus, Amla, Hill guava etc. Some fruits provide iron and other trace minerals also. Lemon, Guava, Watermelon and Sapota.

Fruits have a good proportion of fibre. Fibre in diet in proper

proportion helps excretion, and prevents constipation. This is why inclusion of fruits in the diet is recommended.

Most housewives appreciate fruits because they are the easiest foods to handle. Just wash and serve! Fruits need absolutely no preparation or cooking. Of course, some of them need peeling. In addition fruits lend themselves to be concocted into a variety of dishes. They can be baked, stewed, steamed, crushed, made into salads, ice drinks, ice creams, juices and sherbets. They can also be made into delicious jams and jellies, pickles and puddings. Fruits can be preserved easily because they contain pectin which is a starch like substance that helps in maintaining the texture of fruit.

Almost all the States of India have fruit orchards. Most types of tropical, semi-tropical and temperate fruits are cultivated. It has been estimated that annually India produces 20 million tonnes of fruits. Of this, mango accounts for 9.1 million tonnes, banana 3.2 million tonnes, oranges 1 million tonne, other citrus 0.5 million tonnes and apples 0.7 million tonnes. The total area under fruits in our country is 1.6 million hectares or nearly 1% of total cropped area. Annual export of Indian fruits is valued at Rs. 17 million. The important markets for our fruits are the Gulf countries and other neighbouring nations.

However, the country has potential to increase production and export of fruits. The government has, in recent years set up several fruit and horticulture research stations in different parts of the country, in order to promote fruit cultivation.

Thus, fruits are important foods in terms of health and economy.

Dr. M. Mohan Ram
Deputy Director

February 1983

Extension and Training Division



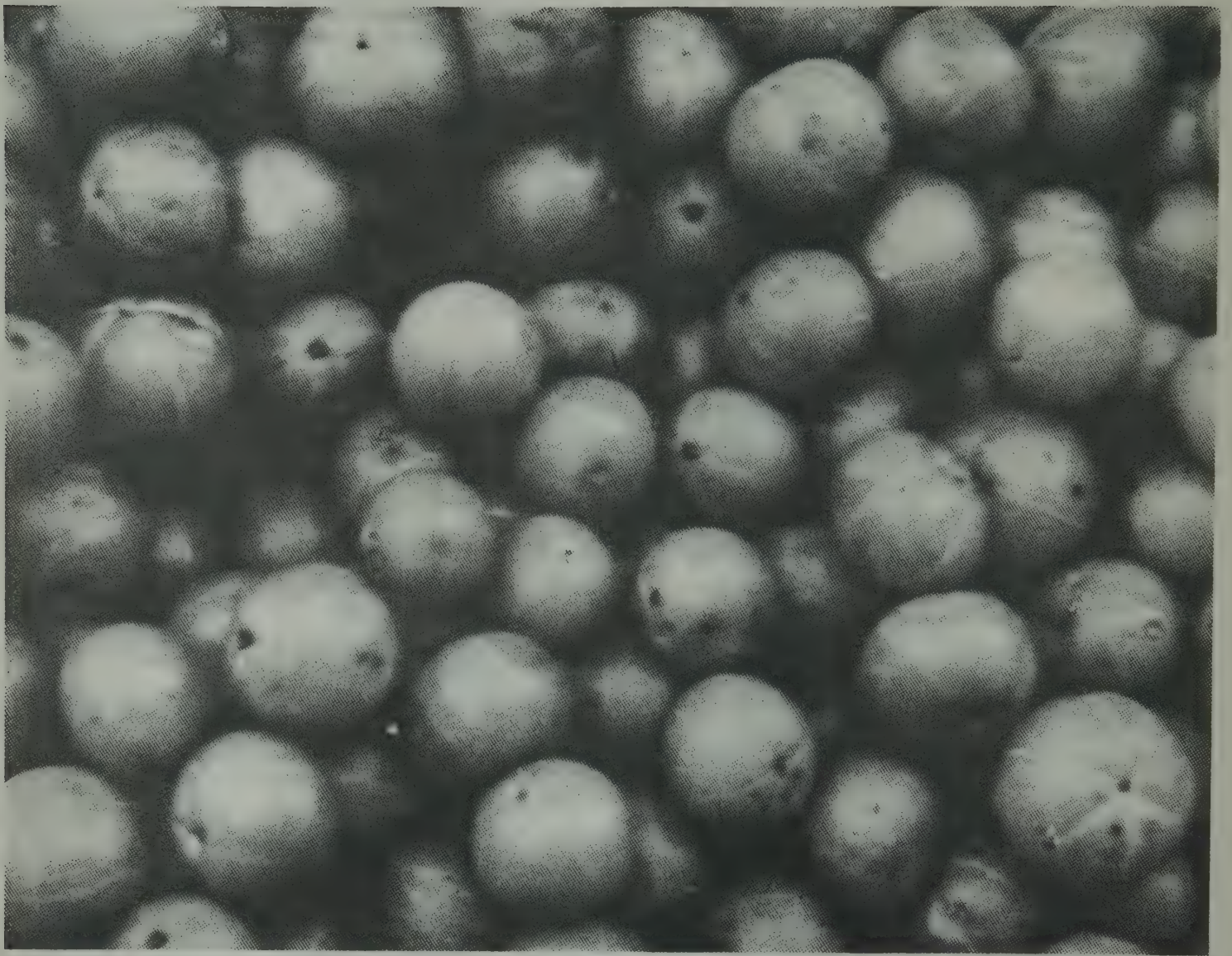
AMLA

Legend has it that the doyen among Tamil poets, Avvayar presented the only celestial Amla in her possession to the prince, Adhiyaman to confer longevity on him and enable him to continue his philanthropic pursuits for the benefit of mankind.

October–December is the season for Amla, the wonder fruit. Highly valued by nutritionists and prized by practitioners of indigenous medicine, the virtues of Amla appear to have been known for long.

Scientifically known as *Emblica officinalis* or *Phyllanthus emblica*, Amla grows wild or can be cultivated. It is known by many names like Amla or Usirikai, Nelli, Gooseberry etc.

Amla is grown in Srilanka, China and Malaysia and in most parts of India. The tree is commonly found in forests upto 4500ft. above sea level. The fruits ripen during winter. They are green when tender, changing to light yellow or brick red when mature. The fruit is sour and astringent and is occasionally eaten raw; Small boys specially enjoy the sweet after-taste of a glass of water after eating Amla. The fruit is a rich source of pectins, and is thus highly useful in making jams and jellies. Amla is much esteemed for making pickles and preserves.



A small variety of Amla, known as Star Gooseberry is sour in taste and usually eaten raw. Amla is probably the richest known natural source of vitamin C. The fruit pulp is reported to contain as much as 600 mg. of the vitamin per 100 g. and the press juice as much as 920 mg/100 ml: nearly twenty times as much as in orange juice. One tiny Amla is equal in vitamin C value to one or two oranges. The fruit contains a chemical substance which prevents the oxidation of the vitamin in it. Therefore Amla is a rich source of vitamin C in the fresh as well as the dry condition. It is a custom in many Hindu families to include Amla in the diet, especially in the first meal taken after a day of fasting. The vitamin is well conserved by preserving the fruit in solution or in the form of dry powder. The dried fruit is reported to lose only 20 per cent of its vitamin in 375 days when kept in a refrigerator and about two-thirds when stored at ordinary temperature.

Vitamin C in Amla has been shown to be readily assimilated by the human system and Amla was successfully used in the treatment of human scurvy in the Hissar famine of 1939–40.

Nutritive value for 100 gms. of fruit

Protein	0.5 gm.	Calcium	50 mg.
Energy	58 Kcal.	Iron	1.2 mg.
Vitamin A	151 I.U.	Phosphorus	20 mg.
Carotene	9 μ g.	Fibre	3.4 gms.
		Vitamin C	600 mg.

Amla fruit has been held in high esteem in indigenous medicine. It is acidic cooling, refrigerant, diuretic and laxative. It is claimed that the dried fruit is useful in haemorrhage, diarrhoea and dysentery. In combination with iron, Amla is used as a remedy for anaemia, jaundice and dyspepsia. A fermented liquor prepared from the fruit is used in jaundice, dyspepsia and cough. Acute bacillary dysentery may be arrested by drinking a sherbet of Amla with lemon juice. Amla is one of the three ingredients in Triphala, a compound in indigenous medicine, used in the treatment of headache, biliousness, dyspepsia, constipation, enlarged liver and ascites.



APPLE

*Eat an Apple every day :
Keep the Doctor away, and
the children at play*

— A child's Rhyme.

The poorest labourer would spend his last rupee to get it for his sick child. The Bible begins with man and woman eating it. Newton discovered some basic laws of science with its help (incidentally). What is the magic of this fruit — The Apple? Why is it one of the most popular fruits in the world?

Mankind was familiar with the Apple as a fruit from times immemorial. However, they called it by the very unromantic name 'Sour Crab'. Botany gives a more musical name to this crunchy fruit : *Malus sylvestris*. In Hindi the Apple is known as Seb.

The Apple can be called an exotic fruit for it is believed to have first thrived in Persia. Now, most temperate regions of the world are stocked with Apple orchards. Wild varieties of Crab Apple can be still found in remote slopes of the Himalayas. Modern varieties of Apple were introduced to India on a large scale in 1887 when McAlexander Coutts first planted an Apple orchard in Simla. The Pear is a close cousin of the Apple and sometimes they are mistaken for each other.

Apples grow best in regions with very cold winters and have snow fall. In India they are grown mainly in Kashmir, Kulu Valley and Kumoan. To a certain extent, Apple orchards thrive in South India in Bangalore and the Nilgiris. About fifty thousand acres in the temperate regions of India are devoted to cultivation of Apples. Ready-to-eat dessert varieties as well as cooking Apples are grown. End of August to late October is the season for this fruit.

The fruit varies in size, shape and colour according to the variety. Elongated pear shaped and perfect rounds are common. The colour varies from leaf green, golden yellow, deep red, to yellowish red. Fruits are sweet or sour according to variety. Sour varieties are used for cooking and for preserves. Some Apples are more crunchy while others are more mealy; colour of the skin is not always a good indicator of the ripeness of this fruit. Overripe fruits often spoil and become unfit for eating. Bad handling and bad storage also tend to spoil them. However Apples can be stored for considerably longer time than most other fruits.

There are various legends associated with Apple which have given it a special prestige. Johnny Appleseed of the USA is also a famous legend. In the pioneering days of America, Johnny planted Apple seeds wherever he went and that is why the US is one of the biggest Apple growers in the world today!

If we consider its nutritive value, the Apple does not compare favourably with the other popular fruits of India, particularly with reference to cost.

The Apple contains practically no vitamin A or C. The Mango and Papaya are far superior in their carotene (vitamin A) content as compared to Apples. Mango and Papaya are cheaper and more abundantly available in their seasons. As compared to 100 g. of the Amla, which has 600 mg. of vitamin C, 100 g. of Apple has

less than 2 mg. of this vitamin. Even the Banana contains 7 mg. of vitamin C and 78 micrograms of carotene (vitamin A).

Apples have very small amounts of mineral nutrients to their credit. Their iron content is just 1 mg. per 100 g. The Gooseberry and Watermelon contain more iron than does the Apple. Apples contain fair amounts of calcium and phosphorus; but the more easily available and cheaper Sithaphal and Sapota contain more quantities of these mineral salts. Calcium available from Apple is equivalent to that from Guava. However, Citrus fruits are much better sources of calcium and vitamin C. An average sized Apple weighs about 100 gms (Range 45–145 gms).

Apples were stored in English ships in the middle ages for it was believed that the fruits prevented Scurvy — a disease due to deficiency of vitamin C. However, lemons were later found to be more useful. Fruits such as Banana, Sithaphal, Sapota contain much more energy than do Apples.

The Apple is a fair source of fibre. Fibre is a term used to refer to the undigestible carbohydrates in our diet. It is also known as 'roughage'. The diet should contain enough roughage to enable proper elimination. Roughage in diet is said to protect a person from digestive disorders and other ailments of the alimentary canal, Fibre also gives bulk to the diet.

APPLES : Nutritive value for 100 gm.

Energy	59 Kcal	Carotene	0 μ g
Calcium	10 mg	Vitamin C	1 mg
Phosphorus	14 mg	Fibre	1 g
Iron	1 mg	Sodium	28 mg
		Potassium	75 mg



Perhaps it is this quality of the Apple that is said to keep a doctor away. This would be more true for people from Western Countries where diet contains very little roughage because of the use of refined foods. Thus the fibre in their diet is provided by fruits. When Apple pieces are exposed to the air, certain chemical substances such as tannins in the fruit make some other nutrients combine with the oxygen in the atmosphere. This reaction causes the brown colouring of exposed apple pieces. When Apple pieces turn brown, vitamin C in the fruit is destroyed. The 'browning' of Apples varies from variety to variety. Some Apples turn more brown at the core than at the surface. Browning can be avoided if pieces are soaked in a salt solution.

Apples can be preserved by slicing and drying in the sun. But this destroys even the small amounts of some of the nutrients. It is better to make jams and jellies of the fruits. Apple can easily be made into such sweet preserves because it has a high pectin content. Apple is also made into juice and fermented to make cider and brandy. Fresh Apple Juice is an amber-coloured liquid with a mild and delicate flavour. The juice is considered as good for diarrhoea and peptic ulcer. It is also used for infant feeding.

Apple butter can be made by cooking Apples in water till they become very soft and then passing the pulp through a fine mesh. Spices and sugar can be added to improve taste. In India a 'Murraba' is made from Apples. It is popularly believed that this Apple murraba acts as a stimulant for the heart and relieves mental strain; However, no scientific evidence is available to support this belief.



BANANA

The Banana, along with Mango and Jackfruit, is considered as the tastiest of fruits in the whole world. When Alexander came to India among the many plants which fascinated him, the plantain was one. He wrote back home about the phala which Indians ate and called it a heavenly fruit tasting like nectar sweetened in honey. It has been sung by ancient bards as one of the great thrifhalas and is botanically known as *Musa sapientum* derived from the Greek words meaning 'food of wise men'.

Cultivated Banana is botanically named as *Musa paradisiaca*. *Musa* is derived from the Arab *mouza*; *chitala mouz* is a common name for green skinned Banana fruit. Banana is a name of African origin though it is used in many countries. Plantain, Vazhai, Kela, Kadali, Baale, Arati are the different names in India.

There is no doubt that the Banana is one of the first food plants cultivated by prehistoric man. The wild plantain perhaps grew first somewhere along the eastern seas of the Indian subcontinent. Now it is a familiar plant in all the tropics.

As it needs a warm, humid, rainy climate and deep, rich, moist soils with much organic manure, the Banana is strictly a tropical crop. The plantain gained a prestige value and popularity in western countries in the 19th century because of its exotic flavour and shape.

The plant is a gigantic herb which springs from the underground stem or rhizome (sucker). The trunk, growing to more than 10 ft. is the sheathed gathering of leaves, while broad branching leaves form a rosette at the top. The flower spike rises from the middle and hangs down with the heavy maturing bunches of fruit.

After a single flowering the mother plant is cut. Fresh shoots rise from the rhizome and the orchard can continue for generations at the same spot. Flowering to full maturity of fruits takes about 10–16 months. The Banana yields a higher amount of edible matter per unit of land than any other food crop; because of this, in many tropical countries it has become the staple food of the people. However a diet with Banana as the staple and very little of other protein foods can cause protein deficiency. This kind of malnutrition has been common in some African countries. In India most of us take cereals as a staple. These usually provide some amounts of protein also in addition to calories.

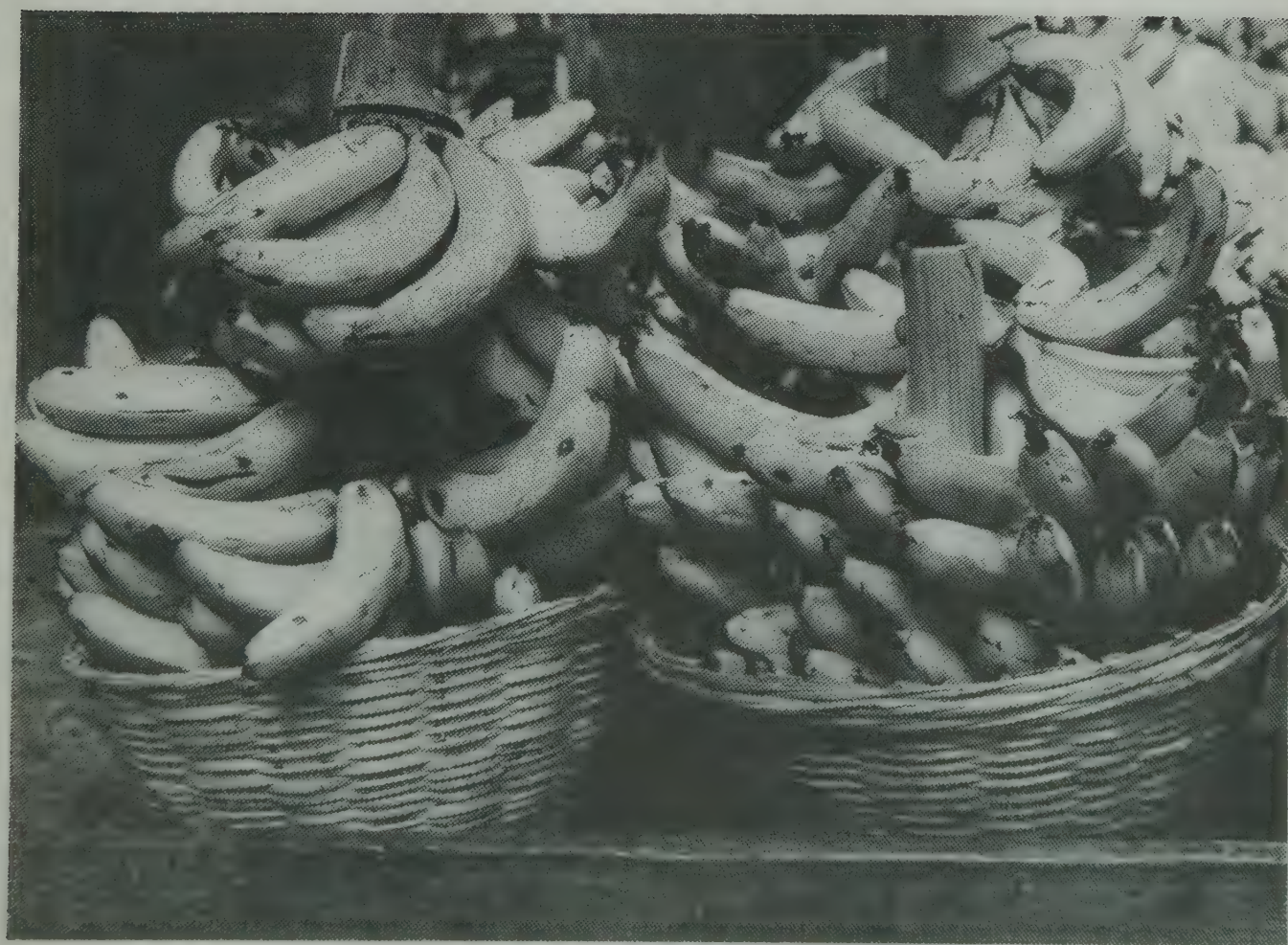
Almost every part of the Banana tree is useful. The fruits both raw and ripe, the flower, inner core or the stem all are edible. The broad leaves are traditionally used as platters for eating and packing. In some places plantain orchards are cultivated mainly for the leaves. The tree stem is used for making a very strong fibre. Rhizomes too are cooked and eaten in some parts. The plant is however very delicate and whole orchards can be destroyed by a storm, typhoon or heavy flood.

The Banana has a typical shape though it varies in size from very large giant varieties to the finger like hill Bananas. Colour ranges over a wide spectrum: different shades of green, light to deep yellows, orange reds, spotted and brown.

Total area under Banana cultivation in India is about 2,70,000 hectares. Yield, on an average, is 45,000 kgs. per hectare. In

1979 about 4.5 million tonnes of fruit were produced in India. A brief description of the 11 commercially most important varieties is given in the next page.

Though all Bananas have a typical flavour, taste differs widely from variety to variety; nearly a 100 types are grown in South India alone. Of these about a dozen are of commercial importance. Apart from India, most Caribbean countries, tropical South America South East Asia and Formosa are Banana cultivators and exporters. Jamaica was the first country to undertake Banana cultivation on a large scale for world-wide export. In terms of cash value and



Variety and common name	Area of cultivation & yield per bunch	Remarks on fruit
1. Mysore		
Poovan, Champa Karpura	East Coast, — more than 100	Medium sized, roundish, thin skin; creamy pulp.
2. Mauritius		
Vamankeli Pachavazhai Basrai, Kabuli	Tamil Nadu Maharashtra — 130 —	Large, curved, dull yellow or green fruits; sweet, soft pulp.
3. Giant Cavendish		
Pedda Paccha Bongali, Jahagi Harichal	Deccan — 160 and more —	Long tapering green fruits; creamy spice flavoured pulp.
4. Silk		
Mutheli, Malbhog Sonkel, Amritpani Rasthali	Karnataka Tamil Nadu, West Bengal; 100 — 120	Medium sized yellow fruit. Highly aromatic and creamy pulp.
5. Ney Poovan		
Devabale Velchi	South India 170 — 180	Slender, medium thin & yellow fruits; pulp of cottony texture.
6. Reds		
Chengadali, Anupan	Kerala, Tamil Nadu 70 — 100	Popular salad fruit; large, curved; reddish sweet flesh.
7. French Plantain		
Nendran, Rajeli, Myndoli	Kerala 70 — 100	Large long, curved yellow fruits; black spotted on ripening. Sweet pulp.
8. Chakkarkeli		
Chitiala Mouz	Andhra Pradesh around 100	Large, thick skin; sweet melting pulp.
9. Pome		
Virupakshi, siru- malai, Vannan	Nilgiris, Eastern ghats Cardamom hills 60 — 80	5 sided, smallish, dull yellow fruits; dry flaky pulp
10. Bluggoe		
Monthan	All South India about 80	Large green fruits, aci- dic in taste, cooking variety
11. Pisaogawak		
Peyan, Kunnan	South India about 100	Compact juicy yellow sweet fruits.

quantity of crop, this fruit is the most important in the world. A large International Trade flows from the tropics to temperate zones with specially designed refrigerated ships called Banana-boats plying their cargo across the seas. Banana yields the year round: the peak season in India being August to April. But export from our country is very minimal only upto Rs. 2.5 lakhs value. Most of our produce is consumed locally.

The Banana is a most valued food item. Ancient Chinese and vedic writings ascribe marvellous healing properties to the vegetable as well as fruit. Its energy content makes it a very advantageous and filling staple though poorer in proteins as compared to cereals. Ripe Banana can augment the diets of small children and convalescents with much beneficial effects. The fruit has about 20% sugar. Cooked or ripe Bananas are very well digested and the nutrients are absorbed well.

Nutritive value of Banana

<i>Fruit</i> <i>100 gms.</i>	<i>Energy</i> <i>Kcal</i>	<i>Calcium</i> <i>mg.</i>	<i>Phosphorus</i> <i>mg.</i>	<i>Iron</i> <i>mg.</i>	<i>Vitamin C.</i> <i>mg.</i>
<i>Ripe Banana</i>	116	17	36	0.9	7
<i>Plantain flower</i>	34	32	42	1.6	16
<i>Green plantain</i>	64	10	29	0.6	24
<i>Stem of plantain</i>	42	10	10	1.1	7

Ripe Banana also has 1.2 gm protein 78µg. of carotene and 0.4 gm. fibre per 100 gms. It has 88 mg. of potassium. A medium sized Banana is about 80–100 gms.

Iron and potassium in Banana are wholly available. Experiments have shown that intake of Banana helps children to retain many mineral nutrients. The fruit is a fair source of B vitamins and calcium. It contains appreciable amounts of many trace minerals

as well as fibre. Apart from this, the fruit has many important acids, enzymes and physiologically important chemical compounds. The Banana develops its particular aroma on ripening because of the presence of a chemical compound called Amyl-acetate.

Ripe plantains have a mild laxative property and hence are very useful in children's dietaries, particularly as a remedy for constipation. At the same time the fruit is helpful to combat diarrhoea and dysentery, heals intestinal lesions etc.

Mashed plantain with milk and sugar can be an excellent supplementary or weaning food for children. Plantains are used in the diets of children being treated for severe malnutrition. Gruel made of Banana flour is a commonly used infant food along the Malabar Coast. Green or raw Bananas are widely consumed as a vegetable and are also very nutritious; the tender stem and flower too are popular in many parts of South India as a household vegetable.

The Green Banana is put to many uses. Fully mature, unripe fruits are made into curries and vegetable dishes. Sliced plantain fried in oil makes very tasty wafers. Chips from Nendran variety common in Kerala are world famous. Both ripe and raw Banana can be made into powder from wafers. This can be stored for quite sometime. Banana powder is very starchy and is used in blends with other cereal powders for various preparations. Peeled ripe fruits are cut into long pieces and dried in the sun to make Banana Figs. These are very popular as a snack for they can be stored for long periods and could be blended with many sweetmeat preparations. Ripe Bananas are used to make several confectionaries, malted milk drinks and even alcoholic beverages.

Bananas are common ingredients in many salad dishes, ice creams and milk shakes. But the best way to eat it is straight after peeling. When ripe, the fruit cannot be preserved for many days as it

spoil easily. Sudden cooling also spoils the fruit and gives an off-flavour. That is why Bananas stored in the Refrigerator do not keep well. Raw Banana will not turn black if cut with a stainless steel knife.

Banana fibre has many applications in the paper and textile industry. In Japan heavy paper used for making house walls known as Abaca is made from Banana Fibre.

So the next time you see the Banana plant remember that it is a very ancient and useful food available to mankind.



GRAPES

Come summer and the shops are filled with delicate blushing bunches of Grapes. These juicy fruits are one of the most delicious food items known. Viticulture or Grape culture is as old as mankind. Naoh of the Bible planted a vineyard. And before him the Pharoahs of Egypt patronized Grape gardens for the heavenly fruit as well as Celestial wines.

Being sweet and juicy, Grapes are popular table fruits; but a large quantity of Grapes are grown mainly for being made into alcoholic beverages. Natural fermentation of crushed Grapes left to stand in a vessel can turn them into liquor.

Grapes are a temperate crop. The vine *Vitis vinefera* originated somewhere near the Caspian Sea of Russia. India is one of the few tropical countries which cultivate Grapes. Though the early medical treatises of Charka and Shushruta mention Grapes, they came to India along with Muslim conquerers through Persia and Afghanistan.

About 25 million acres of land are devoted to Grape cultivation in the world. From the middle-east Grape cultivation spread towards the Western countries: UK., France, Germany, Spain, Italy, Eastern Europe, Greece, and U.S.A. They grow Grapes for their flourishing wine and liquor industries. In the middle eastern regions

of Turkey, Afghanistan, Iran, Iraq, Lebanon, Israel and Egypt, viticulture is mainly for production of raisins or dry fruits. Peru, Columbia, Brazil and India are the tropical countries where table varieties of this fruit are grown.

The Grape vine is a deciduous shrubby climber. It can be propagated by cuttings, grafts. These are normally grown in a nursery to develop roots. They are later transplanted in well manured pits with proper support. Planting is usually done in the month of January. Rocky, untillable soils with fairly dry, rainless climate are quite suitable for Grape gardens. When grown on well manured soils, fruit yield is better. But they are not suitable for making wines.

A good Grape vine can grow to a length of about 35 metres. Grape flowers are green in colour. The vine is regularly pruned to reduce vegetative growth and increase fruit yield. Fruits which set in December will be ready for the market by early April. Good sweet bunches need a growing period through cool dry seasons followed by a hot dry summery spell. Frost and heavy rains spoil the fruit making them insipid and sour. A Grape vine bears its first good crop usually in its 3rd year and then yields regularly for several years. Many vineyards of Europe boast of creepers more than 100 years old.

Botanically the Grape is a berry. Grapes should be plucked when they are ripe as they do not further ripen after being harvested. All the bunches do not ripen at the same time. Hence the plucking season some times extends over 12 to 20 days. When the fruits at the tip turn translucent and soft the bunch is ready for plucking. A gentle whitish blush on the berry is another indicator for plucking. A normal bunch weighs 80 g. and has about 100–120 berries.

Grapes should be handled with great tenderness if they are to be kept unspoilt or transported for long distances.

Nutritive value per 100 g. of fruit

	<i>Blue Grapes</i>	<i>Green Grapes</i>
Energy (Kcal)	58	71
Calcium (mg)	20	20
Phosphorus (mg)	23	30
Iron (mg)	0.5	0.5
Carotene (μg)	3	0
Vitamin C (mg)	1	1
Fibre (g)	2.8	2.9

Nutritionally Grapes have nothing much to their credit. Compared to other seasonal fruits like chiku, guava, sithaphal, they are very poor in nutrients. Grapes are rich in reducing sugars; they have sugars and acids in almost equal proportions. Fruit sugars increase upon ripening. Grape sugars are usually glucose or dextrose. The fruits having more glucose ferment more readily. Very few varieties yield high class wines.

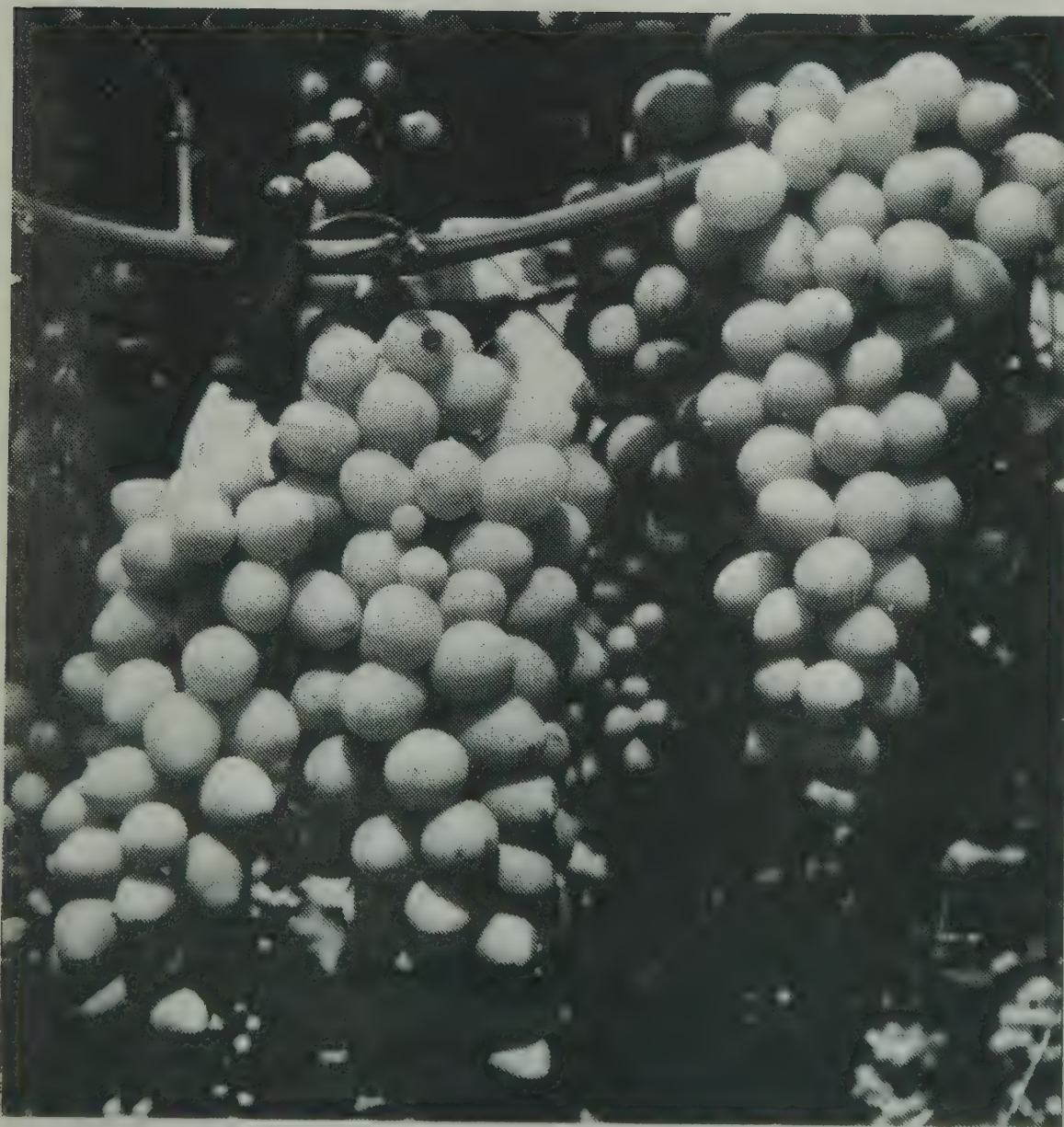
Grapes are unique among food items because they have large amounts of tartaric acid. Among all fermented beverages, wine is the most acidic and most alcoholic. Grapes have large amounts of pectin. So it is easy to make jams and marmalades out of them.

Generally the table Grapes are poor in vitamins including vitamin C. 100 g. of the fruit contains 70 calories and 1 mg. of vitamin C. They are fairly good sources of calcium, phosphorus and iron. Traces of iodine and fluoride are found. Black Grapes are generally better in vitamin C content. They also have traces of vitamin A. The red or purple colouring matter in Grapes is known as oenin. Upon oxidation they produce the 'amber blush'. The exact chemical compounds responsible for the aroma of Grapes and the 'bouquet' or flavour of good wines have not yet been identified.

Ripe Grapes are easily digested. Excess consumption, however, may cause slight flatulance or uneasiness. They are good thirst quenchers, delicious to taste, stimulant for the kidneys and mildly laxative.

Raisins or dried Grapes are good energy givers. Most traditional persons use them to break fasts. Raisins can be given to young children as tasty energy rich adjuncts. In our country, Grapes are known by many names : Draksha, Kodimundiri, Angur, Sounji, Kishmish etc. Viticulture in India is mostly on the Deccan region. Commercial cultivation is mainly in the Hyderabad, Nagpur, Sholapur belt, Bangalore, Nilgiris, Madurai and parts of Punjab.

There are more than 8000 varieties of commercial Grapes. Culti-



vators of table varieties usually prefer the new hybrid types which are heavy yielders, sometimes giving two crops a year. The Vine-fera varieties yield both black and green Grapes. *Riparia*, *Rupes-tria* and *Labrusca* species generally bear the blue or black Grapes. These are more popular in the South especially for making fresh Grape juice.

The blue or black Grape is usually deep red or maroon in colour. The most important types grown in India are anabeshahi, thompson seedless, bhokri and bangalore blue. The anab eshahi or Green Grapes are the large, very popular variety of Andhra Pradesh and Maharashtra. The flesh is soft, meaty with a thin skin and very juicy. Each berry has 2 or 3 hard seeds. This type bears in huge bunches which sometimes weigh 2 kg. Each vine yields nearly 100 bunches in one season. The fruit is sweet for it has 13–16% sugars. This is also a very hardy variety. The bunches can be handled and transported for fairly long distances hence it is a popular market variety. A single anabeshahi berry can weigh 8–9 g.

The Bangalore blue is the next most important table Grape. It has medium sized, spherical purplish blue berries. The fruits which are popular in Tamil Nadu and Karnataka have a thick skin, gelatinous, greenish pulp. The fruits are very aromatic and sweet. They have 15–17% sugars. This variety is a year round yielder and the fruit is especially good for bottling as juice, jams or jellies.

The Bhokri is a hardy vine popular in Northern India. When ripe, this Grape has a brownish tinge. The fruit bunches are large and have a high acidity. They bruise easily and keeping quality is poor. Sultania is another North Indian variety cultivated mainly for making raisins. Thompson seedless, Pusa seedless, Pacchadra-kshai are also very popular. Thompson seedless, is a good raisin variety. Other important types are Kalishahebi, Gulabi, Kandhari Black Prince, Charin, Deccan Prince Habshi, Perlette, Cheema.



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THE GUAVA

The New World or rather South America has given mankind a great variety of foodstuffs. The peanut, the potato, tomato, corn are well known examples. South America has also been the home of a large variety of fruits.

One of the most delicious and luscious fruits known to the world 'The Guava' also came originally from South America. Often hailed as the apple of the tropics, this fruit is now grown in many parts of the world.

The Guava or *Psidium guajava* is now cultivated in all parts of India. The tree is almost naturalised in our country and it is not uncommon to find a spreading shrub laden with aromatic fruits in some remote corner. The Guava is known by different names such as Amrud, Piyara, Peru, Koyya, Jamakaya, Sede Pandu etc.

The Guava tree is a medium sized shrub about 9 meters high. This plant thrives best in areas with good winter season. Apart from this the tree needs very little attention for it is hardy and long lived.

Trees are grown from seedlings or by layering. Seedlings planted during the rainy season grow very well. The plant starts yielding fruits from the fourth year onwards and continues till after 50 years. A mature tree can yield upto 500 fruits in a year. The Guava is a common garden shrub and most household gardens possess at least one sprawling shrub in some corner. A tree usually yields fruits in cycles of three seasons, the best crop coming during the monsoon and in winter. It takes about 5 months from the time of flowering to mature fruits.

In India Guavas are grown on a plantation scale in Uttar Pradesh, Bihar, Madhya Pradesh and Maharashtra. To a certain extent the fruit is cultivated also in Andhra Pradesh and Karnataka. Though the shrub thrives vigorously in the more humid climate of Tamil Nadu and Kerala the fruits are not of very good quality, hence a plantation is not commercially viable in these areas.

The best fruits in India are from Uttar Pradesh. The most famous varieties being Safeda, Chittadar and Karela. These fruits are large and their pulp is sweet and creamy and very aromatic. Other traditional varieties grown in India are Anakapalli, Banarasi, Hafri, Madhuri Seedless etc.

Hybrid varieties released from Agricultural Research Stations are also quite popular. Lucknow 49, Nasik and Darwar varieties give good quality fruits. Seedless varieties are grown in some parts. However, the fruit is insipid in taste and is not very much liked.

Pahadi or hilltype fruits with deep red skins and a purplish red flesh are acclaimed as a delicacy. These red Guavas are said to have a strawberry like taste and are often referred to as strawberry Guavas in Western countries. The red Guava or Pahadiperu has a sweet acid taste and has good flavour. The fruit is most suitable for making jams.



The common Guava is a reddish fruit with a dark or light green skin colour. On ripening the skin turns yellow. The flesh is cream coloured and has numerous small seeds embedded in it. The fruit is sweet, juicy and highly flavoured. Particularly when ripening, the fruit has a penetrating strong scent. However overripe fruits turn insipid and too pulpy.

Immature fruits are highly astringent and not edible. The fruit is best when it is just ripe - that is when the skin has acquired a yellow tinge. Fruits are often plucked right off the tree and eaten just as they ripen.

The fruit is one of the richest sources of vitamin C. It contains 4 to 10 times more vitamin C than do some citrus fruits. The Guava contains very little vitamin A or carotene. However, it is fairly rich in most other mineral nutrients.

The vitamin C value of the fruit increases with maturity and is maximum when the fruit is fully ripe. But the vitamin content declines when the fruit is over-ripe or soft. Among the many varieties the Chittadar is said to be richest in vitamin C. The pahadi variety does not contain large amounts of vitamin C. Guava contains fairly large amounts of phosphorus and calcium. The hill type fruits are particularly rich in calcium. Some pahadi varieties contain about 100 μg of carotene per 100 gms. fruit.

Nutritive value of 100 g, of fruit

	<i>Common Guava</i>	<i>Pahadi type</i>
Energy (Kcal)	51	38
Carotene	0	0
Vitamin C (mg)	212	15
Calcium (mg)	10	50
Phosphorus (mg)	28	20
Fibre (gms)	5.2	4.8
Iron (mg)	1.4	1.2
Potassium (mg)	—	91

A medium sized Guava weighs about 80 to 100 g. All parts of the fruits are edible.

The Guava contains numerous pale coloured seeds. These seeds are quite rich in an aromatic oil (14%) which is orange yellow in colour. This oil contains considerable amounts of iodine and is hence used in some special medicinal preparations. The leaves of the Guava tree also yield an essential oil which has a pleasant and agreeable odour. The Guava oils are used in the perfumery and confectionery industries. Guava leaves are used for tanning superior quality leathers.

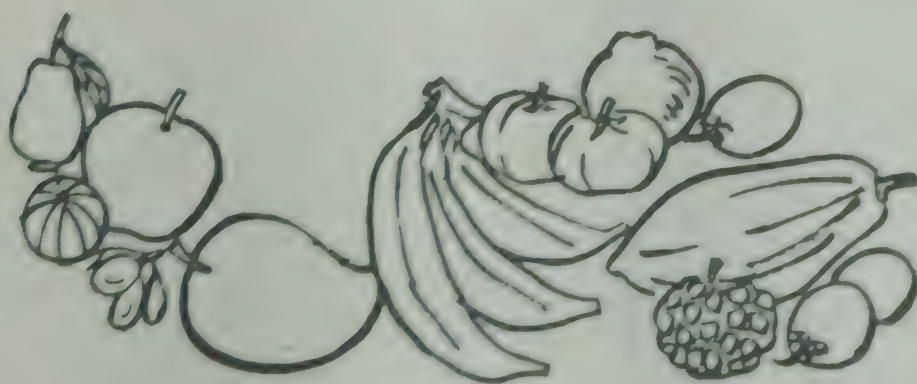
The Apple of the tropics has various medicinal properties. Though this fruit came to India only with the Europeans it has been used for various medicinal preparations of the traditional systems.

Guava leaves and bark are powdered and used for dressing wounds and sores. A decoction of fresh, young leaves is said to be good for digestive disorders. The decoction is also used for arresting vomiting and diarrhoea. Powdered leaves are applied to soothe rheumatic pains. A decoction of Guava leaves could be gargled to relieve tooth-ache and gum boils. The flowers of Guavas are said to be cooling and are used for treating bronchitis.

Guava is usually eaten as a fresh fruit. However, large quantities are canned or made into jams, jellies, cheese and preserves. The fruit has a high pectin content and it therefore lends itself to many such preparations. Its flavour adds to the richness of ice-creams and fruit-salads. The rind or outer skin of over-ripe Guavas are often used for salads and curries.

Guava juice is very tasty and refreshing. It is extensively used for infant feeding in Hawaii as a substitute for tomato or orange juice.

Since the tree is easy to cultivate its fruits can be used profitably. Mashed and sieved Guava pulp can make a good infant food during weaning stages. Guava juice, Guava candy, Guava cheese etc., make good snacks for children. Since most of these preparations have sugar added, they have a high calorie value.



JACKFRUIT

“If it was possible to mould honey into a ball then it would be the pulp of Jack fruit” – this is a free translation of a line from old Tamil poetry.

The Jack fruit or Panasa is a heavily flavoured fruit most popular in South India. It is considered the greatest among fruits along with the Mango and Banana.

Being truly tropical the Jack tree has neither spread very far nor has it attained much popularity in regions other than where it grows. However, in its native land – Tamil Nadu, Malabar and Kerala – the fruit enjoys immense popularity. Housewives in these regions are able to concoct a great number of culinary delicacies not only from the ripe fruit but also the unripe fruit and its seeds.

The Jack tree (*Artocarpus integra heteropyllus*) is indigenous to the Western Ghats. It grows all over the Deccan and in Bengal and Bihar. The tree thrives well and is quite popular in Burma, Malaysia, Srilanka, Brazil and tropical Africa.

The tree yields best in moist well drained fertile soils. A mature tree attains a height of over 50 feet. Thus it is popular as a shade giver and is grown in home gardens. It shades the coffee and cardamom plants in plantations of South India.



The tree has a straight cylindrical stem. Fruits grow to droop from the stem almost from the base and on all the more older woody branches. Because of this characteristic, the Jack-fruit tree has a very prosperous and fertile appearance during its bearing season. Hence it is considered very auspicious to have the tree in home gardens.

Trees are grown from seeds or by layering and grafting. Normally a tree starts yielding fruit only after 8 years. In the North it takes even longer. However, some varieties like the Singapuri and Ceyloni yield even within 3 years.

A tree can yield about 250 fruits in each season which lasts from March to July. Sometimes fruits are available even till September. On an average a mature fruit weighs about 20 kg. But only 30% of this is edible. Each fruit is covered by a thick spike-studded skin which is dark green in colour. Upon ripening the Jack fruit begins to have its typical flavour and the outer skin starts becoming pale yellow or deep brown.

The fruit contains a large number of seeds each enclosed in a juicy yellow sheath. This yellow fleshy portion is highly flavoured and it is the popular Jack fruit. There are mainly two types of Jack fruit, one has crisp juicy flesh (Kapa), the other has a more mealy soft flesh (Barka). The former is preferred as it is sweeter and better flavoured. Two varieties Singapuri and Kudraukshi are to a certain extent grown in orchards for marketing because they yield even sized uniform fruits.

Jack fruit 100 gms.

Energy	88 Kcal	Carotene	175 μ g
Fibre	1.1 gms	Vitamin C	7 mg
Calcium	20 mg	Potassium	191 mg
Phosphorus	41 mg	Sodium	41.1 mg
Iron	0.5 mg		

Edible matter in the fruit consists of the fleshy part and the seeds. The fleshy part is a low fibre low calorie fruit. Nutritionally the fruit does not have much to its credit. It has some quantities of carotene (175 μ g per 100 g.) and vitamin C (7 mg / 100 g.).

Though well appreciated for its taste the fruit has the reputation of causing bowel upsets if eaten in excess. Still there are many popular dishes made of Jack fruit mixed with jaggery or honey which are energy rich recipes. Because it has a high pectin content the fruit can readily be made into jams, jellies and marmalades. On the other hand, Jack fruit seeds are more nutritious. They contain about 7 g. of protein for every 100 g. Seeds are usually eaten after they are roasted on open fires. Some times they are shelled and steam-cooked. Sun dried seeds are powdered and the meal is used in making soups and as weaning foods.

Unripe Jack fruit is eaten as a vegetable when cooked with dhals. The outer skin and all the fibrous parts are relished by cattle. The leaves are popular as feed for goats. The bread fruit known as '*Seemapila*' in India is similar to the Jack fruit. However it is smaller in size and more fleshy with hardly any seeds. It is more common in Malaysia.

Thus the Jack fruit which has a unique taste as well as nutritious seeds deserves better appreciation even in regions where it is not grown. Try some this season.



JAMUN

In the days gone by, eminent poets challenged their contemporaries in the literary field, in order to establish their supremacy. They would then call out their challenge by planting a sapling of the Jamun or Naval tree on a sandy river bed before beginning the poetic wordy duel.

The Jamun tree which is native to India thrives easily on hardy tropical regions and is found in all parts of our subcontinent as well as countries of South-East Asia and Eastern Africa. The tree botanically identified as *Syzygium cumini* is known by several local names such as Jambas, Jamun, Rajaman, Kala Jamun, Neredu, Naval, Nerale, Jamali, Black plum and Black berry. From times immemorial the fruit has been appreciated for its unusual taste, flavour and colour. Children are fond of the fruit and its property of colouring the tongue purple when sucked. Others appreciate the fruit for its medicinal qualities especially its value in treatment of diabetes.

The Jamun tree is a large evergreen, grown widely in the Indogangetic plains, and Cauvery delta of Tamil Nadu. Odd and scattered trees are mostly found in the plantations and along streams, damp places and swamps. Self-sown seeds germinate in the rainy

seasons after dispersal by birds and animals. Another common way of growing Jamun is to plant them as shade trees near houses or on roadsides. The fruit ripens in June – July and the tree continues to give fruits for 60–70 years.

The Jamun fruit is generally of an attractive purple colour. It is sub-acid to sweet, in taste. It is available in plenty, is cheap and very common in both villages and city markets. The fruit is picked almost daily and sent to the market the same day, as it is highly perishable and cannot stay in good condition for more than two or three days.

Nutritive value per 100 g. of fruit

<i>Nutrient</i>	<i>Jamun</i>	<i>Roseapple</i>
Energy (Kcal)	62	39
Iron (mg)	1.2	0.5
Calcium (mg)	15	10
Phosphorus (mg)	15	30
Vitamin C (mg)	18	3
Folic acid (mg)	3	—
Carotene (μ g)	48	141
Fibre (g.)	0.9	1.2
Potassium (mg)	55	50
Magnesium (mg)	35	4
Sodium (mg)	26.2	34.1

Of the several types, the most common variety is Ra-Jaman bearing big oblong, deep purple or bluish fruits with pink, grayish, juicy sweet pulp and small-stones. Another is the inferior Kaatha, bearing small fruits with acidic pulp. Improved varieties have also been developed; these bear purple to violet or white, seedless fruits.



The Roseapple (*Syzygium jambos*) is another tree belonging to the same species. These fruits known as Gulab Jamun, Perunaval, are very popular because of their rose flavoured pulp. Roseapples are almost as big as apples; they have a pale colourless crisp flesh, often tasteless. The shrub is usually grown in home gardens because it is very ornamental.

The edible portion in Jamun fruit forms around 70 per cent of the whole fruit. Glucose and fructose are the principal sugars in the ripe fruit and not even a trace of sucrose is detected. It is a fairly good source of vitamin C and mineral salts. The waxy portion of the fruit and fresh leaves yield an oil with an odour like unripe mangoes.

Jamun is believed to be of special use in the treatment of diabetes. The extracts of the bark, seeds and also leaves are used. Aqueous extract of the seeds is reported to cause marked, prolonged decrease in blood sugar, when injected into dogs. Experiments carried out at Central Drug Research Institute, Lucknow, showed

that oral administration of dried alcoholic extracts of the seeds to diabetic patients reduces the level of blood sugar and glycosuria. Fresh seeds appeared to be superior to dried ones. Jamun seeds are fairly rich in protein and calcium. Jamun flowers are an important source of good quality honey which is amber coloured.

Extracts from bark of the Jamun tree have a moderate antibiotic activity. The bark is astringent and is used for gargles and mouth washes. A decoction of the bark and powdered seeds is considered useful in the treatment of diarrhoea and dysentery.

Jamun is acidic. It is eaten usually after sprinkling salt. Fresh fruits are tasty but they can be preserved in the form of fruit candies and jams. Fruits are used for making preserves, squashes and jellies. The juice of unripe fruit is used to make vinegar which has attractive colour, good flavour, taste and aroma. Ripe fruits are often made into good wines especially in Goa. Jamun trees are usually planted along road sides and in coffee plantations because of the shade they give and as wind breakers in fields. In some regions tassar silk worms are reared on Jamun trees.

Note : This article is to a large extent based on a write up on this fruit by Miss B.V.S. Thimmayamma which appeared in Nutrition, July 1982.



MANGOES

The unique shape of this golden fruit has captivated the imagination as well as taste of people over several centuries : Infact its shape is now recognised as a symbol of Indian art and culture. The Mangopattern motif is inevitable in exquisite art pieces be it a brocaded saree border, an exquisite carpet or intricate sculpture. Even the dreaded summer of unbearable heat is welcomed by most Indians for it is the season of the king among fruits.

The Mango is one of the choicest and most appreciated of all fruits because of its aromatic flavour and taste. It is considered as one of the triphalas and attributed with several superb qualities. Therefore the fruit occupies a very important part in Hindu mythology and religious observances. Sanskrit literature refers to the Mango as *Amra* or *Chuta* suggesting it to be the source of Amruta or Nectar. Definitely it does taste like Ambrosia and has the added advantage of being very nutritious both as a raw as well as ripe fruit.

Mangoes have been in cultivation in India for atleast 4000 years. *Magnifera indica* as it is botanically known, is said to have originated in the lands around the Bay of Bengal. Later the fruit spread to all parts of the Indian subcontinent. It was taken to Persia and Egypt by Arab merchants; Trading ships introduced the fruit to other tropical countries including the West Indies. Now Mangoes

are cultivated on a large scale in China, Malaysia, Philippines, Indonesia, Australia, Southern USA, Mexico and West Indies.

In India the Mango occupies about 60% of the total area under fruit cultivation. The fruit has several local names as derived from the Sanskrit Amra or Tamil Mangai. Uttar Pradesh, Bihar, Andhra Pradesh, Maharashtra, Orissa and Punjab grow Mangoes on a large scale.

Mango trees blossom and fruit better in regions where there is a good rainfall for four months, followed by dry weather for the rest of the year. They do not thrive well in very humid zones. Flowering to fruit is in summer or the hot months and takes about 5 months. Rain, fog or cloudy weather at the time of flowering affects fertilization and fruit-setting. Bad weather favours the onset of pests and disease. Trees are propagated by cuttings, seedlings or layering. A Mango tree starts bearing fruit at the end of its 4th year. Fruits are borne usually once in two years except in the case of some varieties. The *Neelam* type bears fruit every year.

The season yielding a heavy crop is called 'on' year. This happens generally once in five years. The season of lean crop is called 'off' year. In the first bearing season, a Mango tree yields only 10 to 15 fruits. However by 15th or 20th year yield increases upto about 1500 fruits. From 20th year onwards upto 40th year the number would be anywhere between 2000 to 4000 and later there will be a decline. In the 'on' season the yield can be about 10,000 fruits even after 60 to 70 years. The life span of a Mango tree is about 100 years. There are reports of abnormally rich harvests obtained from Mango trees in some parts of India and from abroad as well. Older trees should be scientifically pruned and manured to obtain best yield. There are several fruit research stations in different parts of our country who have been evolving more fleshy and tasty fruits suitable for export markets and canning.

A large number of varieties of this fruit are grown : each of these has its own flavour, taste and pulp consistency. Many are important commercially, and are hence cultivated in large orchards. Mango varieties get their names because of several criteria such as royal patronage, place, texture, taste and flavour. Most people find the very names mouth watering.

NOMENCLATURE OF MANGOES

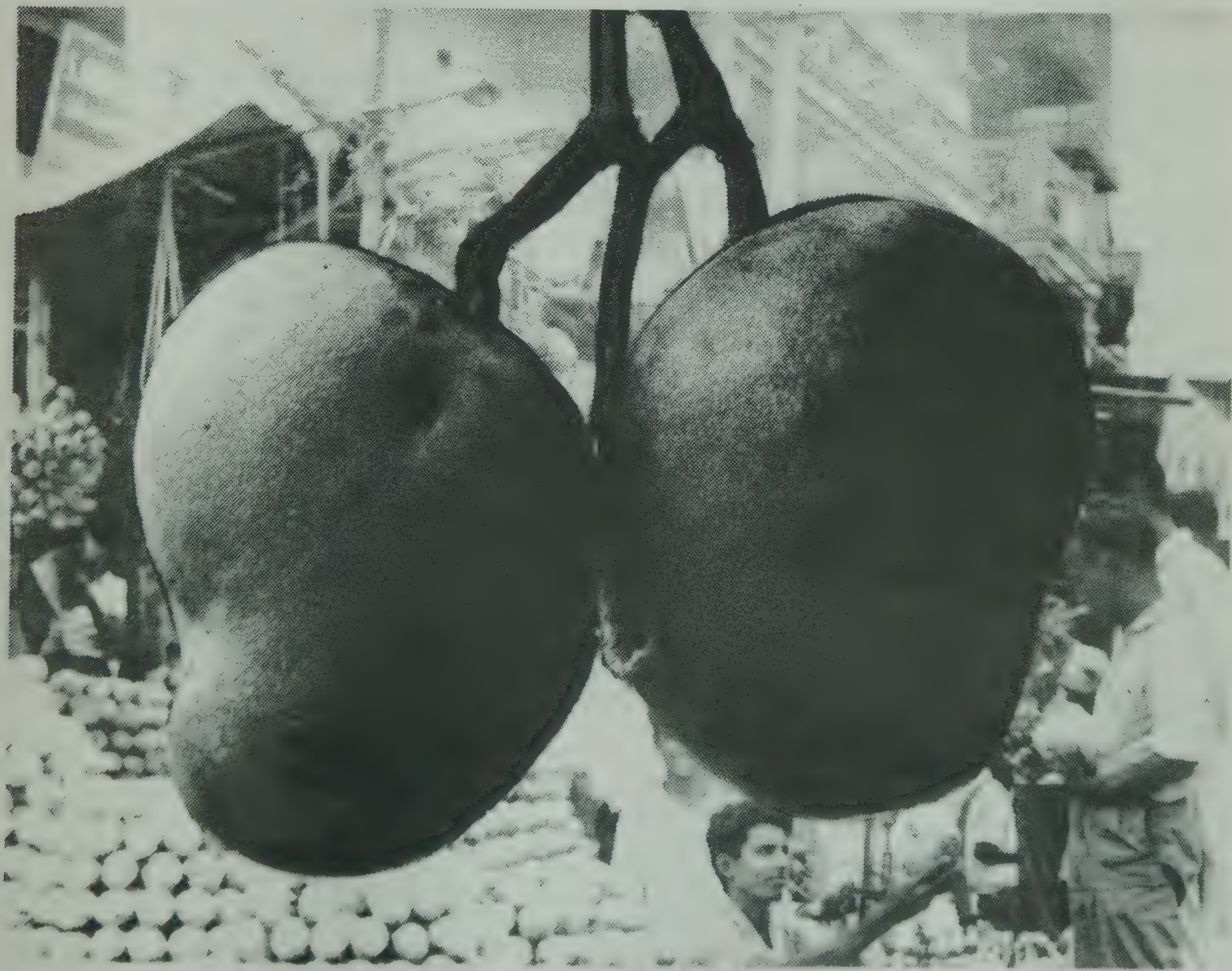
<i>Basis of Name</i>	<i>Names of Varieties</i>
Kings or other nobility	Himayuddin, Imam pasand, Jehengira.
Titles or surnames	Collector, Alphonso
Localities or places of origin	Banarasi Langra, Dussehri, Alumpur, Beneshan, Banganapalli
Romantic ideas	Dilpasand, Gopalbhog, Manoranjan
Size	Hatijhul, Hamlet, Peddarasalu
Shape	Totapuri, Laddu, Kharboja
Colour	Zafran, Sinduria, Suvarnarekha
Taste	Atimadhuram, Panakalu, Mulgaon
Flavour	Tenneru, Kothapalli Kobbari
Precious stones	Neelam, Manikyakatti
Cropping season	Baramasi, Dophool, Bhadriya, Shravanya
Animals	Machili

Keeping quality of fruits ranges between 2 to 4 weeks depending on the method of storage. Refrigeration and air freight have now enabled transport over long distances. Europe, Russia, Middle East, U.K. are very good buyers for Indian Mangoes. The most commonly grown varieties such as Mulgoa, Safdar, Neelam, Alphonso, Banganapalli, Suvarnarekha, Dussheri, Langra and Bangalora are exported to various countries. Mango fruit products like chutneys, pickles, amchur, ampapar, jams, jellies, squashes and slices are also exported.

For the money spent on them Mangoes are most nutritious. They are an excellent source of carotene (provitamin A) as compared to other common fruits. Ripe Mango is also a very good source of vitamin C. Raw Mango has appreciable amounts of Iron. The fruit is a fair source of potassium and other trace minerals. If consumed during the seasons when they are available in plenty, Mangoes help to prevent many diseases such as vitamin A deficiency blindness.

Nutritive value of 100 g. of Mango.

	<i>Energy Kcal.</i>	<i>Fibre g.</i>	<i>Calcium mg.</i>	<i>Iron mg.</i>	<i>Carotene µg.</i>	<i>Vitamin C. mg.</i>
Green Mango	44	1.2	10	5.4	90	3
Ripe Mango	74	0.7	14	1.3	2743	16



The Mango is a highly prized dessert fruit in India. It has a rich, juicy, aromatic taste — a combination of sweetness and acidity. Juice, jams, jellies, pickles, sauces, sweetmeats—Mango preparations are endless. But to derive the most out of the nutrients in this fruit it is best to eat it just as a ripe fruit. Naturally it is an important ingredient of fruit salads, fruit melbas and ice creams. The Mango pickles of Andhra Pradesh are world famous.

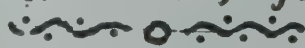
Extracts of leaves, bark, stem and unripe Mangoes are reported to possess to a limited extent antibacterial properties against some micro-organisms. The core or stone of the Mango known as the Mango kernal has wide application in Ayurvedic medicine. In recent years it is gaining commercial importance as a source of edible oil or as a cocoa butter substitute.

Dried Mango flowers are astringent. They are said to be used in the treatment of diarrhoeas, chronic dysentery and some conditions of the bladder. Tender Mango leaves known as Mango tops are consumed as a vegetable in Java and Philippines. They are good sources of vitamin C. Mature Mango leaves are also used as feed for cattle in times of scarcity.

Mango bark contains about 16 to 20% tannin and may be used for tanning purposes. The bark yields a colouring matter which is used in dyeing cottons to a beautiful rose pink.

Peeled unripe Mangoes are cut into small thin pieces and dried in the sun after seasoning with turmeric powder. This dried material known as amchur is used as such or as a powder. It keeps well for about 3 years if stored in air-tight containers. Amchur is used as a souring agent in Indian cookery.

Note : This article is based to a large extent on a write up on this fruit by Miss B.V.S. Thimmayamma, which appeared in Nutrition, July 1980.



MELONS

When the last lingering cold of winter has gone and the musty heat of summer sets in, our markets get filled with the fragrance of Melons. Fruit-carts overflow with huge Melons of all shapes and colours.

The water Melon and musk Melon are very popular summer fruits in India. The numerous folk songs, stories and jokes about Melons which are popular throughout the length and breadth of the country show that Indians have over many generations enjoyed eating this luscious fruit.

Those familiar with the King Vikramaditya stories may remember that the tale begins with King Bhoja's army entering a Water Melon patch and eating away all the fruit. The owner of the plot challenges the king and his army. Finally, a settlement is reached and the king buys the land. When he digs up the plot he finds the throne of King Vikramaditya. Though Water Melons may not always hide fabulous thrones, they certainly can quench the summer thirst. Numerous varieties of fruit of different sizes, colours and tastes are grown in all parts of the country.

The fruit is particularly popular in the hot, dry regions of Punjab and Rajasthan. Melons are often cultivated in sandy river bed where no other crop would normally grow. This is because the annual creeper thrives best in a hot climate in deep, sandy soil with no water-logging, but needs plenty of irrigation. Melon creepers start bearing fruit within 4–5 months after seeds are sown. Two crops of Melon can be cultivated, one in January–February and another by June–July.

The Water Melon which is botanically identified as *Citrullus vulgaris* is believed to have been a native of tropical Africa. This fruit is known in Hindi as Tharbuji or Tarbuz. The fruits are large and can achieve a diameter of even 20 inches. The bottlegreen outer rind covers a fleshy portion which is soft and spongy. The pulp is most often reddish-pink with large, black, seeds embedded towards the centre. Some varieties have a creamy white pulp, but the pink fruit is preferred because it is sweeter.

In some hilly areas a bitter variety is grown. This Melon is valued for its medicinal properties for it is considered a diuretic, that is, it helps in proper excretion of urine and prevents water retention.

Only 60% of the fruit is edible; the rest is rind and fibrous material. The Water Melon is a good source of pectin. Hence, the fruit can easily be made into Jams, Jellies and Marmalades. The fruit is best consumed in the form of squashes, juice, or as, ripe slices.

The inner portion of the dark-coloured Water Melon seeds are parched and eaten. The seeds contain 34% protein and 52% oil. Oil extracted from Water Melon seeds has a pleasant odour and taste. It is used for certain special culinary preparations or for lighting lamps. The seeds as such are considered to have a 'cooling' effect. The seed cake is rich in protein and hence makes good cattle feed.

Nutritive value of 100 g. of fruit.

100 g. of fruit	Musk Melon	Water Melon	Tinda
Moisture (%)	95.2	95.8	93.5
Energy (Kcal)	17	16	21
Carotene (μ g)	169	0	13
Vitamin C (mg)	26	1	18
Calcium (mg)	32	11	25
Phosphorus (mg)	14	12	24

In India, a more popular Melon is the cantaloupe or Musk Melon. Also known as sweet Melon, it belongs to the *Cucumis melon* family; in Sanskrit this fruit is praised as the Madhupaka. This fruit is often sought after by elderly people for breaking religious fasts such as Shivarathri. Its local name is Karbuja.

The Karbuja differs from the Water Melon in having an outer rind that has a netted lace-like marking. The rind is soft and has a yellowish orange, creamish or green colour. The fruit is eaten as a delicacy, because of its typical musk like flavour and taste. The pulp is often rich orange in colour. A creamish fruit is also quite popular. Musk Melon makes a very good ingredient in fruit salads, ice creams, milk shakes etc.

At present, large tracts of dry, sandy land in Punjab and Rajasthan are under Musk Melon cultivation. The fruit is grown in considerable quantities also in Bihar, UP, AP, and Maharashtra. It is grown in all parts of the tropical world. Musk Melon seeds also are edible. They are used as substitutes for almonds and pistachios in confectionaries and sweetmeats. The seed kernal is very

tasty and is eaten after removal of bran. It is rich in protein (36%) and oil (45%). A popular belief is that Musk Melon pulp is very good for eczema.

A less popular variety of Melon, *The Tinda* is grown in Punjab, where it is a poor man's vegetable. The Tinda or round gourd is used to make a variety of sweetmeats.

From the nutritional point of view the Melons do not contain any appreciable amounts of mineral salts or vitamins. They are poor yielders of energy. More than 95% of the fruit is water.



The Melons are most undoubtedly refreshing fruits, and are very suitable for making squashes, sherbets and juices which quench the summer thirst. Because of this, the fruit will continue to be popular in our country.

ORANGES AND LEMONS

The very name 'citrus' conjures in our minds several images : a mouth watering acid sweet taste, a refreshing flavour, a soothing drink in fever and illness and of course the thirst quenching lemonades of hot summer.

Citrus fruits are inevitable ingredients of a breakfast drink, and refreshing components of aromatic bath soaps and perfumery. Somehow most of us associate citrus fruits with the sunny, sandy coasts of the mediterranean sea. However the fact is that the original home of almost all the juicy fruits of this family is the region of the Malay archeipelago. Mankind has appreciated and consumed citrus fruits from prehistoric times. The health promoting value of these fruits was recognised in the recent past.

Citrus fruits belong to a family of aromatic evergreen shrubs called *Rutaceae*. There are about 16 distinct species which are widely cultivated for their edible fruits. These are Lime, Lemon, Citron, Orange, Mandarins, Mosambis, Grapefruit, Pummello, Tangerines, Shaddocks, Kumquots.

The first cultivators of Citrus even 4000 years ago were the people of South China and Southern India.

Citrus fruits were introduced to Europe and Middle East by Alexander some time in the 3rd century B.C. Roman conquests and Arab traders helped further popularity. Now citrus fruits are major commercial crops in most semi-tropical countries such as USA, South Africa, Spain, France, Italy, Turkey, Iran, Israel, Northern African countries, Australia, India, China, Japan, Korea, Malaysia etc. Surveys in early 70's showed that over 4 million acres of land all over the world were devoted to the cultivation of Citrus fruits.

All the fruits of the Citrus group have extensive culinary applications. Lime is often used as a souring and bleaching agent. Fresh juice is equally popular. Citrus fruits are often preserved as pickles, jams, jellies, squashes and sherbets. The fruits also enjoy the reputation of having good medicinal value. Amongst other fruits the citrus is one of the most nutritious.

Vitamin C in Citrus fruits protects a person from scurvy a dreaded disease causing body sores, bleeding gums etc. English sailors are to this day called *Limeys*, because according to law their sailing ships carried limes which were distributed on long sea voyages

NUTRIENTS IN CITRUS FRUITS

Fruits (100 gms)	Energy (Cals)	Calcium (mg)	Phospho- rus (mg)	Iron (mg)	Pota- ssium (mg)	Caro- tene (µg)	Vit. (mg)
Nimbu	59	90	20			15	63
Mosambi	40	40	30	0.3	490		50
Orange	48	26	20			1104	30
Sweet Lime	35	30	20	1.0	210		54
Lemon	57	70	10	2.3	270		39
Pumello	44	30	30	0.3		120	20
Grapefruit	30	20	20				31

to protect the seamen from scurvy. Compared with other foods, citrus juice supplies large amounts of several vitamins on a per calorie basis. Citrus juice has abundant quantities of vitamin C.

The Oranges of the *reticulata* family are also good sources of beta-carotene or vitamin A. Citrus fruits also have fair amounts of most mineral nutrients like calcium.

Perhaps that is why Citrus is important in diets of invalids and convalescents. All the Citrus fruits supply large amounts of potassium and calcium.

The important sugars in Citrus fruits are sucrose, glucose and fructose occurring in a ratio of 2:1:1. Thus they are good energy foods too. The acidity in these fruits is mainly due to citric acid. In the sweet varieties, acidity comes down upon ripening and at the same time fruit sugars increase. Most citrus fruits have a trace of bitterness in them. This bitterness is due to the presence of flavonoid compounds called narangin and limonoids. The aromatic principle in these fruits is due to a chemical substance called limonene and other essential oils. All these chemical compounds are found to have expensive use in industry, pharmaceuticals and food processing.

In Northern Europe and England Citrus gardens are maintained for their aromatic flowers which are used in perfumery and confectionary. Orange blossoms are considered as appropriate headwear for traditional brides in these countries.

The third most important group of fruits in markets of India are the Citrus. Nearly 7% of area under fruits i.e. about 1,00,000 hectares of land are under Citrus cultivation. The leading producers are the states of Maharashtra, Madhya Pradesh, Assam, Andhra Pradesh,



Karnataka, Tamil Nadu, Gujarat, Uttar Pradesh and Punjab. The botanical identification and nomenclature for different popular citrus fruits is given on page 51. All these fruits are cultivated in India. The more popular fruits are the Santra or loose jacketed Orange, the Mosambi or Sathugudi and the Lime or Sour Nimbu.

The cultivation practice for each of these plants is quite different. However Citrus trees thrive well in a sub-tropical climate with no frost, well manured and well drained sunny, sandy regions are quite suitable. Plants can be propagated by seeds, budding, cutting, layering or grafting. Drip irrigation gives quite good results. Israel has successful Citrus Orchards in desert lands. The well grown shrub needs yearly pruning for good fruiting. Orange trees suffer if they are water logged or if the soil is saline.

English Name	Botanical Name	Other Names
1. Lime	<i>Citrus aurantifolia</i>	Kaghzi Nimbu, Elumichai Nimma, Lebu, Nyomb
2. Lemon	<i>Citrus limona</i>	Bara Nimbu, Jambira, Bijori, Bijapura, Galgal, Limbo, Poonaranga
3. Citron	<i>Citrus medica</i>	Mahaphala, Rusaka, Kadara- narthai, Lungamu
4. Sour Orange or Seville	<i>Citrus aurantium</i>	Bitter Orange, Bigrade, Khatta, Naranga, Karna, Heralay, Satsuma
5. Sweet Lime	<i>Citrus limonettiodes</i>	Mitha Nimbu, Kolumichai, Gajanimma, Chikna
6. Sweet Lime Sweet Orange	<i>Citrus sinensis</i>	Sathugudi, Sweet lime, Malta, Mosambi, Battayi, Chini, Oranju
7. Mandarins Oranges	<i>Citrus reticulatus</i>	Orange, Santra, Kamala, Satsuma, Tangerine, Mandarine, Kichi
8. Grapefruit	<i>Citrus paradisi</i>	Pardesi, Bari nimbu
9. Shaddock	<i>Citrus maxima</i>	Forbidden fruit, Pumella, Chahotra, Panis, Pumblimas
10. Pumello	<i>Citrus grandis</i>	Pumalli, Kumquat.

Orange trees start bearing fruit from about their 5th year onwards. Santra trees grown from seedlings start fruiting at around 8 years. Fruits mature and are ready for plucking at about 9 months after blossoming. Fruit season in different regions varies according to climate and cultivation practice. Fruits are generally plucked when they are ripe. Marketing is in loosely packed boxes or baskets.

The Lime or Kaghzi Nimboo *Citrus aurantifolia* comes under the category of acidic fruits of India. It has wide use for pickling, as a souring agent, in sherbets and soft drinks. Its local names are

Nimbu, Elumichai, Nimma etc. The tree is actually a short thorny shrub or bush. It bears round fruits (3–4 cm in diameter) with a tightly attached thin smooth rind. The rind is dark green and upon ripening turns yellow. The fruit is juicy with a few seeds and is very aromatic. Nimboo trees thrive best in Southern India where the temperature does not turn too cold. Nimbu flowers are small pure white and are borne in clusters. The more famous varieties of this Citrus is Rangpur, Round and Ovale. A variety quite popular in Maharashtra has an orange coloured pulp and rind. In our indigenous medicine Lime is used as a stomachic, appetizer and antiscorbutic. It has much use in cookery as well as cosmetics.

The Lemon *Citrus limona* is a straggling tree with large leaves and purple coloured flowers. The fruits are big and heavy, longish with a prominent nipple. They have a thick rind which is bright yellow on ripening. Juice is acidic. Genoa, Villa Franca, Jaffna Lisbon, Eureka are popular varieties grown in our country. The common names for this fruit are jambira, bara nimbu, poonarangai, bijori etc. They are used for cooking meat and fish, making sherbets, for bleaching and as a stain remover.

Lemons have been used in home remedies for common cold and treatment of diarrhoea. Since Lemons are a good source of vitamin C perhaps they have a beneficial effect of building up resistance against infection. Also lemon juice can be a good base for formulation of oral electrolyte solutions for treatment of dehydration and diarrhoea. Lemons have commercial value in manufacture of citric acid, pectin and Lemon Oil.

In a year Lemon or Lime tree yields about 2000 fruits. They can be stored and transported for long distances because they do not damage easily. Lime can best be stored at room temperature in households. Refrigeration helps storage even upto 2 months. Galgal is a hill Lemon grown in North India but it is a poor yielder.

The Citron *Citrus medica* is known in India as Mahaphala, Rusaka, Kadanarthai, Lungamu etc. It is popular for making pickles and preserves; but Citron is more in demand for its medicinal value. The fruit is large obovoid with a thick dark green warty rind. The pulp is acidic. But juice is slightly sweetish. The powder made from dried rind and leaves is used for treatment of dysentery.

Another very popular Citrus valued for its acidic and aromatic pulp which can be pickled is the Sour Orange or Bitter Orange *Citrus aurantium*. This is also known by many names like bigrade, khatta, naranga, karna, heralay and satsuma. This is a native to South India and grown on a large scale in Andhra Pradesh, Tamil Nadu and Karnataka. The most important variety cultivated all over the



world is the seville. The rind and pulp are slightly orange in colour. The fruit has plentiful sour juice. It is a good source of carotene and vitamin C. The volatile oils obtained from sour Orange has extensive use as a base oil in perfumery. The fruits of this sour lime have a slight bitter tang therefore they lend themselves to the fruit juice and fruit pickle industry.

Commercially the most important of the table variety of Citrus fruits is the Sweet Lime or Sweet Orange. These are better known as Sathugudi or Mosambi *Citrus sinensis*. The name Mosambi is a corruption of Mozambique. Sathugudi which is also known as Malta, Chini, Oranju, Battayi is grown all over India. The peak season for fruit sales is the winter months November to February. The fruit is large with a tight skin. Juice is sweet-acidic and highly flavoured. The important commercial varieties are Malta, Bloodred, Valencia, Hamlin, Shamouti, Pineapple, Batavian, Jamburi. The pulp of good variety sathugudis is usually straw coloured. The Pineapple variety is the sweetest and has a primrose yellow colour.

Mitha Nimbu *Citrus limonettoids* also known as kolumichal, gajanimma or Chikna is popular mostly in India. It has plentiful juice, is used for treatment of fever. The limonettoid shrub is heavily branched, bearing globose large fruit. They have a thin rind and tasteless flesh. However they are hardy, heavy yielders.

Next in importance is the Mandarin or loose jacketed Orange. *Citrus reticulata*. The region of Vidharbha and Nagpur in India is world famous for producing the largest and best mandarin Oranges of Asia. The mandarins are also known as kamala, santra, sarsuma, tangerenes. They are the most popular Citrus grown in China, Japan and far Eastern Islands. India has about 70,000 acres of land under Kamala Orange cultivation. The Mandarin Oranges are a very good source of vitamin A as well as vitamin C. They also have fairly large amounts of B vitamins. Both the Man-

darin and Sathugudi Oranges are appreciated as table fruit, as constituents of fruit salads, fruit juice and sherbets.

The Grapefruit *Citrus paradisi* is grown in a large scale in the West Indies. It is a popular breakfast fruit. The fruit is large and well segmented with pinkish attractive flesh. The rind is very thick. Pulp is juicy. Fruits are usually eaten with a sprinkling of salt or sugar in our country. Grapefruit is grown in the hilly tracts of tropical India.

Forbidden fruit *Citrus maxima* also known as shaddock, pumella, pamblimas, chahotra etc. is a Citrus which originated in Malaysia and Polonesia. It is grown to a small extent in Central India for marketing in urban areas.

The Pumello *Citrus grandis* is another minor Citrus known as pumalli, kumquot. It is cultivated in some regions as a mixed crop. All the Citrus are very nutritious, refreshing and popular. Try as many varieties as you can this season.



PAPAYA

Our country abounds in a variety of fruit trees which could cater to every whim and fancy of taste. Importance of fruits in one's diet is very well recognised. In India, the Mango is recognised as the king among fruits. But there is also a poor man's fruit which could share this reputation easily, from the point of nutritive value or taste. Papaya is grown to a certain extent in all parts of India and deserves to be more popular than it is at present.

The plant *Carica papaya* is a native of Central America. It was introduced into India by the Dutch traders sometime in the 16th century. From here it spread to all the South East Asian countries. Papaya is now grown widely in various parts of the tropical world, particularly in India, Sri Lanka, Australia, Philippines and South Africa.

In India about 17,000 hectares are under Papaya cultivation. The fruit is known by various names such as Papeeta, Boppadi, Pappali. Papaya tree grows very rapidly and is easy to cultivate. Seeds planted in a corner of the kitchen garden will soon shoot up into tall trees. The fruits can be harvested within a year. The tree bears fruits throughout the year for about five years. At a time, a tree can yield upto 100 fruits, each weighing about 1 kg. Papaya grows best in sunny places and requires minimum irrigation. There are also dwarf varieties giving good harvests.



Papaya is a very wholesome fruit. As a source of vitamin A it is unrivalled by any other fruit except perhaps the Mango. With its deep yellow colour, the ripe Papaya fruit contains large quantities of a substance called carotene. This pigment is similar to that found in carrots, beetroot, dark green leafy vegetables like drumstick leaves, palak, curry leaves etc. Carotene in food is converted into vitamin A in our body.

Regular consumption of Papaya will ensure a good supply of vitamin A and C which are both essential for good health.

Eating Papaya helps to prevent blindness caused by vitamin A deficiency which is quite common among a large number of children in India. The fruit provides this important vitamin which prevents night blindness. Papaya is a cheap fruit available in all seasons in all places to all people. Papaya has more carotene compared to other fruits such as Apples, Guavas, Sitaphal, Plantains etc. Hence it gives the maximum nutritional returns for the money spent.

Nearly every part of the Papaya tree is said to have some medicinal value. This property is mainly due to a substance called *Papain*, which is present in all parts of the tree and fruit. Papain is an excellent aid to digestion. It is an enzyme which helps to digest the protein in food. Hence it is used in various medicinal preparations. Papaya has the property of tenderizing meat which is often cooked together with raw Papaya pieces to make it tender and digestible.

Pieces of Papaya laid on wounds and surgical incisions are reported to speed up their healing. In USA Papain from dried Papaya is imported for use in the tanning, brewing, wool and food industries. Quite a large number of people believe that Papaya should be avoided by pregnant women as it may cause a miscarriage. Scientifically speaking, there is no evidence to support this belief.

Scientists have found that the black seeds of Papaya contain, in traces, a toxic substance called Carpine. Carpine in large quantities, is said to lower the pulse rate and depress the nervous system. The substance is found only in Papaya seeds and that too in very small quantities. Fortunately the fleshy part of the fruit is completely free from this toxic substance. Hence the delicious fruit can be safely eaten, once the seeds are removed.

Nutritive value for 100 gms of fruit

	<i>Papaya</i>	<i>Raw Papaya</i>
Energy (Kcal)	32	27
Calcium (mg)	17	28
Iron (mg)	0.5	0.9
Carotene (μ g)	666	0
Vitamin C (mg)	57	12

There are various varieties of Papaya grown in India. Two of the most popular and tasty ones are the Washington and the Honeydew varieties. Both these varieties have large, deep-yellow coloured fruits when ripe. The fruit is tasty and sweet and has very little of the typical Papaya flavour. Honeydew is an almost seedless variety and hence is more popular.

Jams, Jellies, Marmalades and Squashes can be made from Papaya. Produced on a large scale, the fruit can be canned and preserved. The fruit blends easily into fruit salads and ice creams.

Raw Papaya can be eaten as a vegetable. But one drawback is that raw Papaya contains no carotene. It however has a large amount of vitamin C and some mineral salts. Traditional systems of medicine consider the green fruit as a mild laxative. Juice from green Papaya often appears to be used to cure skin blemishes.

Cultivation of Papaya trees in school and kitchen gardens must be made more popular. Its nutritive value, ease of cultivation and early maturity (less than 9 months) are definite advantages. Most National Nutrition Programmes encourage the cultivation of Papaya in school and home gardens. Because of such programmes, Papaya is slowly becoming quite popular in our country.



PINEAPPLE

To the English, all fruit is synonymous with the Apple. Every new fruit they ate was an Apple of one kind or another.

Thus in the 15th century when the pioneers of the new world brought home a strange fruit full of pines and needles, yet crunchy and sweet to taste, they called it the *Pine Apple*. The plant which bears the botanical name *Ananas comosus* is a herb with a thick stem from which leaves branch out in all directions. The fruit is borne in the middle of a cluster of leaves. The *Ananas* originally belonged to tropical America. The fruit is said to have come to India in the year 1548 along with colonial traders. Being a truly tropical crop, the fruit thrived in India and soon spread to different countries of South East Asia.

At present Hawaii and Malaysia are the leading Pineapple growers in the world. Brazil, Central American countries, Africa and Australia contribute to a large part of the world trade in this fruit. In fact, tinned Pineapple from Australia is famous all over the world. In India, the Pineapple is grown on a commercial scale along the coastal areas of Andhra Pradesh, Kerala and to a certain extent in Bengal and Assam.



The Pineapple shrub thrives best in a mild tropical humid climate. The crop requires only moderate irrigation. The plant is grown from suckers planted in rows and it takes 15–20 months for bearing fruit. On an average 6–10 tons of fruit can be harvested from an acre of crop. In Hawaii a mammoth yield of 40 tons per acre has been recorded.

The Pineapple is known as Annasi in India. In Kerala the fruit is called *Kazhidachakka* and it is often grown as hedge or fence crops. The fruit has a very rough and prickly surface, and a thick skin full of small eyes with prickly thorns. It has a crown of small leaves. The colour of the outer skin can vary from a bright yellow to deep orange. The flesh is juicy and fibrous with a light yellow orange colour. The fruit has an attractive, crunchy, acidic taste. There are about 90 varieties of Pineapple. However, only two varieties are grown in our country. These are the Queen and Kew varieties.

Newer hybrid varieties with either higher yield or a shorter span of maturity are being tried in a few experimental stations. Some Desi varieties grown along the Visakhapatnam coast of Andhra Pradesh are also quite popular in local markets.

Pineapple should be harvested at the appropriate time so that the full flavour and taste can be attained. For this, the fruit should be plucked when the eyes on the outer skin turn pale green or when the base of the fruit turns light yellow.

Nutritive value per 100 gms.

<i>Energy (Kcal)</i>	46	<i>Carotene (μg)</i>	18
<i>Calcium (mg)</i>	20	<i>Thiamin (mg)</i>	0.2
<i>Iron (mg)</i>	1.2	<i>Vitamin C (mg)</i>	39

Most of the crop is used for canning. First the fruit is graded according to size and quality and then sent to a central place. A fruit is sliced into circular pieces with all outer layers removed. The pieces are immersed in a sweet syrup with preservatives. Wastes from canning factories are valuable cattlefeed. Some of the material is fermented and used for manufacturing industrial alcohol.

In India, only the fruit grown along the West Coast has been found suitable for canning. As such, the industry has much scope for greater expansion. Pineapple syrup has a great demand in the fruit, jam and juice industry because it blends very well with all fruit juices.

Though only 60% of it is edible, the Pineapple is a good source of thiamine (vitamin B₁) compared to other fruits. The fruit is very rich in vitamin C. Fresh Pineapple juice contains an enzyme

called *bromelin* which aids digestion. Juice of the ripe fruit is considered to be a diuretic (helps to pass urine easily) while juice from an unripe fruit acts as a purgative.

In the Philippines, Pineapple is more popular for non-edible purposes and is widely cultivated. A kind of very strong fibre is extracted from two year old leaves of this plant. The fibre is of a light colour, shiny and very durable. It is not damaged by water. An expensive variety of cloth called Pina is made from this fibre. Waste from the textile industry is used for making paper.

In most parts of the world the fruit is better known as an indispensable part of fruit salads and fruit cocktails.

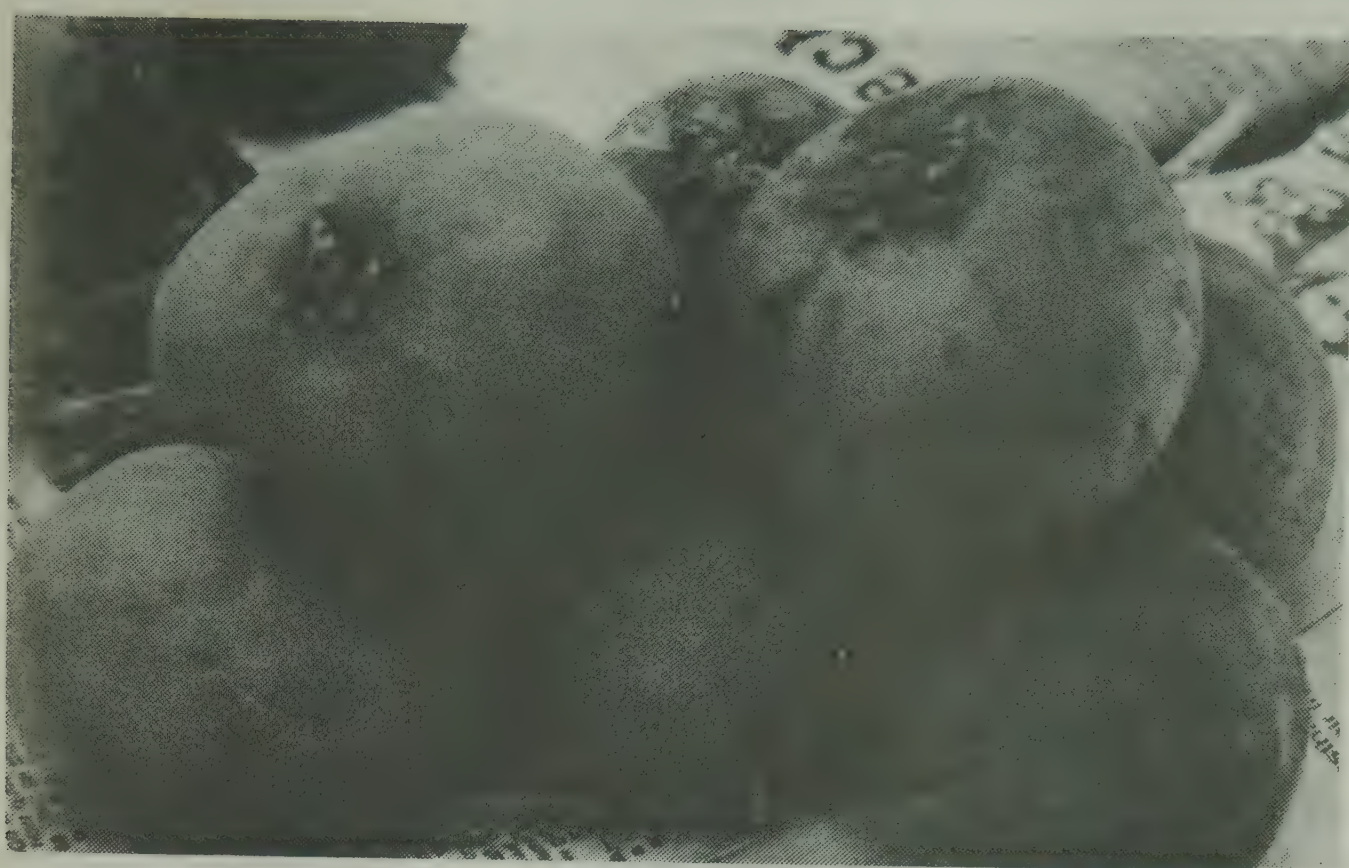


SAPOTA

There are numerous seasonal fruits available in India; among these the Sapota enjoys immense popularity in the coastal areas. Small, soft and sweet, the Sapota has an unusual flavour and a grainy melting pulp of deep brown colour. The fruits are usually available in plenty when other common fruits go out of the market. Hence the Sapota is a favourite seasonal fruit which is also particularly relished by children.

The Sapota *Achras zapota* is an evergreen tree indigenous to South America and West Indies. The wild tree reportedly grew in China too. However, this fruit came to be cultivated in India only a few centuries ago. The Sapota tree thrives best in moist, tropical sea-side regions. In India it is cultivated in large tracts of Maharashtra, Tamil Nadu, Andhra Pradesh, Bengal.

The Sapota which is also known as *Chiku* or *Sapodilla* is a seasonal fruit available during March-April or August-September. The Chiku fruit is a round or oval berry with a soft, thin, brown skin. The flesh is granulated and the black seeds embedded in it can be easily separated from the pulp.



Edible Sapota is prized when it has firm, good pulp of rich flavour and few seeds. There are many popular commercial varieties. The type called Pala Sapota which is common in Andhra Pradesh is considered best in this aspect though fruits are small. There are some large-sized varieties from Maharashtra which are also very popular. Some of the other commercially important types are Dwara-pudi, Vavivalasa, Bharani and Kalipatti.

Nutritive value for 100 gms of fruit

<i>Energy (Kcals)</i>	98	<i>Carotene (μg)</i>	97
<i>Calcium (mg)</i>	28	<i>Vitamin C (mg)</i>	6
<i>Iron (mg)</i>	2.0		

Sapota trees can easily be cultivated in home gardens or orchards. They are ornamental as well as good fruit yielders. In U.P. and Bihar, some heavy bearing varieties are popular because of their commercial importance in the confectionary industry. This is because the milky latex or resin which is secreted from unripe fruit, known as *Chikle*, forms the base for making chiklets and chewing gum. Chikle has a good export market potential also. The Chiku is a good source of energy for almost 14% of its pulp is sugar. The fruit also has some amounts of iron, carotene and vitamin C.

Sapota pulp is extensively used for making sweets and halwa. It is also an ingredient of fruit salads and milk shakes. A bitter principle found in unripe fruits, called 'Sapotonin' has pharmaceutical uses. Certainly, Sapota is an easily available low-cost fruit with a delicious honey-like flavour which is relished by one and all.



SITAPHAL

The Ramayana is so very much a part of Indian culture that a certain family of fruits have been honoured with the name of Sita, Rama and Hanuman. The heroes and heroines of the great epic seem to be commemorated in almost all activities of daily life.

Of these fruits, the Sitaphal is quite well known; though the Ramaphal and Hanumaphal are less famous, they too are cherished and eaten as delicacies in certain regions. All these fruits belong to the *Annona* family of shrubs. This shrub is perhaps a native of the Americas, but now it is naturalised in India. The plant with dark green leaves and woody stems is often seen growing wildly. The plant and its fruit are profusely represented in ancient art as well as literature; hence Indians from times immemorial must have eaten this *Butter Apple*.

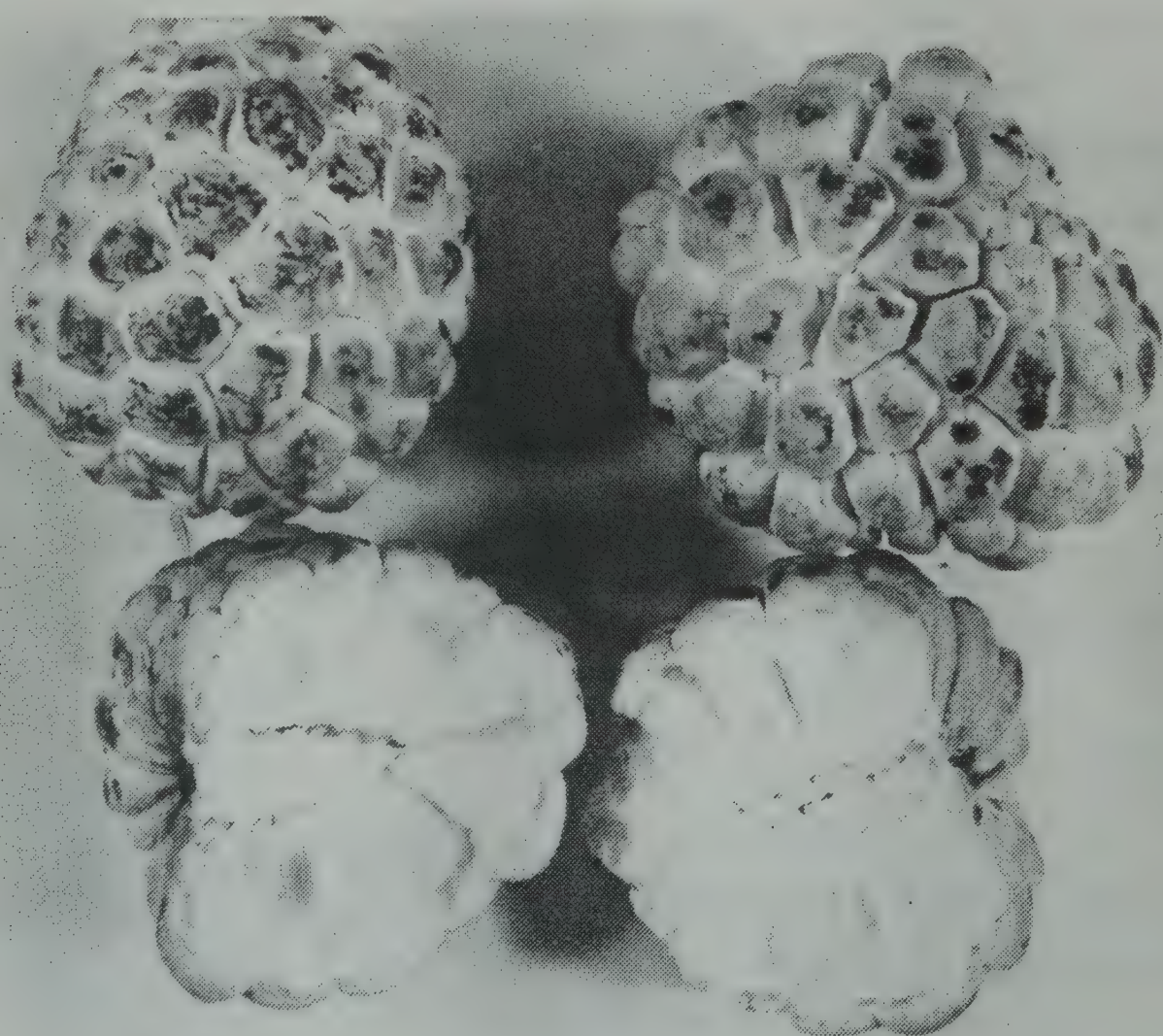
About 50,000 acres of land in India are devoted to *Annona* cultivation. However, a larger quantity of the fruit is grown in home gardens and is mostly consumed without any marketing. Mexico, the United States, Australia, Sri Lanka and certain Pacific islands also cultivate these fruits.

Sitaphal is the most famous of the annonas. It is recognised botanically as *Annona squamosa*. The plant grows to a height of 15 to 20 ft. into a small evergreen tree. The shrubs are often planted near garden fences. It is easy to grow in home gardens and is quite popular.

Sitaphal wood is considered to have insecticidal properties. It is not attacked by white ants and is hence used in villages for making carts and for house tops.

A substance called *annonaine* which is present in the leaves and bark of this wood makes it bitter. Because of this, sheep, goats and other animals do not graze upon them. This is one reason for the shrub being used for fencing.

Sitaphal is known by many names - Custard Apple, Sugar Apple, Sweet Apple, Sharifa etc. The fruit is yellowish green with small eye-like bulges. When ripe, each eye is picked out by a black dot. The fruit pulp is juicy and creamy. It has a typical delicate flavour and buttery taste. The pulp is often blended together with milk to make puddings, ice creams and milk shakes. In the villages of Telangana (Andhra Pradesh), when this fruit is half-ripe, it is baked over a coal fire and eaten. In some parts, the pulp juice is used to make fermented drinks.



An alcohol extracted from Sitaphal is known as Anocorin. It is said to possess insecticidal properties and is thus used in various pharmaceutical preparations. Oil extracted from Sitaphal seeds is also said to possess similar properties. Each fruit contains numerous brownish black seeds which can yield upto 30% oil. All parts of the shrub i.e., leaves, stems, bark, roots, fruit and seeds are reported to have various medicinal uses. Traditional vaidas and hakims are reported to use them as ingredients for various decoctions and potions. The root is said to be a drastic purgative and the seeds violent abortifacients.

Another less familiar fruit belonging to this same botanical family is the Hanumanphal. It is grown only in a few hilly areas of Karnataka, Andhra Pradesh and Sri Lanka. At present, quite a large-scale cultivation of this fruit is reported in the areas around Hyderabad. The botanical name of this fruit is *Anona cherimolia* and hence it is also called the Cherimoya or Cherimola.

Nutritive value of 100 gms of fruit

	<i>Sitaphal</i>	<i>Bullocks Heart</i>	<i>Cherimoya</i>
Energy (Kcal)	104	70	89
Fibre (g)	3.1	5.2	1.5
Calcium (mg)	17	10	30
Phosphorus (mg)	47	10	20
Iron (mg)	1.5	0.6	0.4
Carotene (μ g)	0	67	2
Vitamin C (mg)	37	5	7

Large quantities of this fruit are cultivated on a plantation scale in parts of Australia and also in California. Hanumanphal is quite large in size and is said to be very delicious. In fact, it is considered as the tastiest of the Annonas. It contains lesser number of seeds than Sitaphal and has a more buttery pulp. A cross variety

between Sitaphal and Cherimoya known as *Atemoya* is also grown in India.

Ramaphal or *Annona reticulata* belongs to the same species. This fruit is heart shaped and yellowish red in colour and can have a diameter of 3–5 inches. In West Bengal, the fruit is called *Nona*. It is also known as 'Bullock's Heart'. However, the fruit is rarely grown on a commercial scale in any part of India. This is because, though edible, the fruit is tallowish and insipid.

The largest fruit of the Sitaphal family is the Mundla Sitaphal or the Soursop: known as *Annona muricata* it is also heart shaped and is somewhat like a small jack fruit with thorny bristles covering all its surface. It is very aromatic and tender and is often eaten as a vegetable in some South-East-Asian islands. The seeds of this fruit are used as fish poison by some tribals. The soursop is grown only in some parts of Telangana (Andhra Pradesh), Assam and Burma. The fruit pulp is white and juicy and it has a pleasant acidic Mango like flavour. Because of this, it is often called as Mamphal. In Assam, a popular fermented drink is made from the pulp of this fruit. The pulp yields excellent jelly and is often preserved as such; it is also used to make milk shakes and ice-creams. This fruit is sometimes referred to as Lakshmanphal. However, it is not as sweet as the Sitaphal.

Analysis showed that fruits of the *Annona* families have excellent calorific value. Apart from this, Sitaphal is a good source of vitamin C. It also contains mineral elements such as calcium and iron. The other annonas also are similarly fair sources of these nutrients. In addition, the Bullock's Heart contains β -carotene (precursor of vitamin A).

Since custard apples are a fairly good source of essential nutrients they deserve more appreciation. The fruit pulp is easy to digest and it can be eaten easily by children of all ages. Sitaphal pulp can be mixed with weaning food mixtures and fed to infants.

TOMATO

Best of all, Fire Ball, Roma, Red Cloud, Desi Dixon, King Humbere — they may sound like the names of favourite race horses, but are not! In fact, these are some popular varieties of tomato which is aptly termed 'the most popular vegetable fruit'

Tomato is a well-known and very popular vegetable grown throughout India. It ranks as the world's largest vegetable crop after potato and sweet potato. Tomato tops the list of vegetables which are canned. It is a versatile fruit-vegetable used as soup, salad, pickles, ketchup, and many other items apart from being used for making juice. Available in the market almost round the year, it is cooked as a vegetable by itself or with potato, brinjal or greens; it is also eaten raw when ripe.

The origin of Tomato is traced to the Peruvian, Mexican regions. The Red Indians of Mexico are reported to have referred to it as "Tomati". While the Spanish explorers introduced tomato into Europe during the early sixteenth century and Portuguese brought it to India.

A fleshy berry, taking about 5–7 weeks from blooming to ripening, Tomato is essentially a warm season crop and cannot withstand severe degrees of frost. The crop fares well under average tempe-



perature of 21°C - 23°C , It cannot be grown successfully in places with a high rainfall. Ideally, a rich, loamy soil, with some sand in the upper reaches & a good clay subsoil, is suited for Tomato cultivation. A warm, sunny weather is a must for proper ripening, colour development, quality and high yield. Nutritive value of the fruit is also known to be affected by temperature and light intensity.

The plant is usually transplanted. But when direct-seeded, the Tomato plant develops a deep-rooted system and will be drought-resistant. A continuous supply of fruit can be maintained through a planned sowing schedule.

The stage of maturity at which Tomatoes are picked depends on the purpose for which they are grown. Proposed distance of transportation should also be considered while picking. Firm, mature, green fruits are picked for shipping. Fully ripe Tomatoes are selected for canning. Immature green, mature green, turning half-ripe or pink or red ripe are the different stages when the fruit is picked.

The Tomato fruit varies much in shape. To some extent, genetic qualities influence the shape. But the shape of the fruit is also determined by temperature, soil salinity, size and the number of fruits in a truss. Crop cultivation at higher temperatures, yields a high proportion of round fruit. A considerable proportion of fruit are rough, badly shaped when grown under relatively low temperatures. Generally, larger the size of the fruit, greater is its tendency to attain a poor shape.

The crop has to be protected against a number of diseases caused by fungi, bacteria and some viruses. Yields reportedly vary from 16,000 to 24,000 kg, per hectare.

Nutritive value per 100 gms of fruit

Energy	(kcal)	20	Iron	(mg)	0.4
Phosphorus	(mg)	20	Carotene	(µg)	351
Calcium	(mg)	48	Vitamin C	(mg)	27

Tomato is generally accepted as a nutritionally desirable food article. Its juice is recommended for children as a substitute for orange juice.

Tomato is a rich source of vitamins, particularly vitamin C. Normal processing does not seem to adversely affect its nutritive value particularly its vitamin C content. There do exist some beliefs associating Tomato with a variety of disease conditions including hypertension. But there is no scientific evidence to support them.

It is generally believed that Tomato consumption may result in the formation of bladder stones and that Tomato may not be suitable for those who suffer from a tendency to gout or uric acid diseases. Analysis of Tomato has shown that it contains around 4 mg. of

oxalic acid per 100 gms. of fruit. In fact, it has been found that Tomato contains less purines than do carrots, potatoes, cabbages and other vegetables and less oxalic acid than do beets, potatoes, cucumbers and lettuce. Purine and oxalic acid are substances generally known to be associated with bladder stone formation.

Since Tomato is a fruit of good nutritive value, specially with regard to vitamins, and is easily available at a relatively low cost, its inclusion in the daily diet, particularly of young, growing children is very desirable and should be encouraged.

Note: This article is based on a write up on this fruit by Mr. V. Ramadas Murthy, which appeared in 'Nutrition' of April 1978.



RECIPES

MIXED FRUIT JAM

Ingredients :

Fruit pulp	2 kgs.
Sugar	2 kgs.
Citric acid or lemon juice & preservative	

For fruit pulp take

Apples	1
Papaya	1 medium sized
Banana	2 medium sized
Pineapple	1
Kamala Oranges	2
Mosumbi	2
Sapota	4 large
Black Grapes	250 gms.
Green Grapes	100 gms.
Guava	4 large

Method :

1. All fruits should be mature, fully ripe, clean without any bruises or insects. They should have good colour and aroma. Do not add too many bananas for it will spoil the taste. None of the fruits should be over-fibrous.
2. Wash fruits thoroughly, remove stems, seeds, skin, core, pips etc.
3. Take guava pieces and grapes separately. Cook them in a thick bottomed vessel with a little water. Mash with wooden butter churner, sieve and filter to remove seeds. Keep pulp aside.

4. Remove orange and mosambi segments, skin them and remove seeds.
5. Cut all fruits into fairly large pieces. Put them in a thick bottomed vessel with a little water and cook for 5–8 minutes.
6. Mash all fruits to form even consistency pulp. Seive to remove skin, seeds etc.
7. Mix guava, grapes and other fruit pulp together.
8. The black grapes would give the pulp a deep pink colour. If it is not enough add a little raspberry red colour.
9. Measure pulp.
10. To one volume of pulp, mix one volume of sugar i.e. one cup sugar for one cup pulp.
11. Cook the mixture on a slow fire, stirring regularly to ensure that the bottom does not scald or burn.
12. The Jam should now boil and thicken evenly.
13. When jam is nearly thick (it falls like a sheet and not in a single stream) add citric acid or lime juice. (2 gm. per kg of pulp or two spoons lime juice per kg. of pulp). A little more citric acid can be added if fruits are very sweet. The proportion depends upon the sourness of fruit pulp. Citric acid should be added only after cooking the pulp for some time.
14. Cook till jam reaches thick consistency like idli or dokhla batter.
15. Remove from fire and add a pinch of preservative (potassium meta bisulphate) and mix.

To bottle the Jam : Jam jars such as glass bottles should be well washed, rinsed in hot water and dried in the hot sun. They should then be filled with Jam and closed with a tight fitting lid, after cooling for some time. While filling the jars keep them on a wooden board in order to avoid cracking.



FRUIT JELLY

Jelly is made from clear, strained fruit extract. It should be clear, transparent and of an attractive colour with good flavour and aroma. It should not be gummy, hard, syrupy or sticky. Select fresh, ripe fruit. Guava, woodapple, oranges, papaya, jamun, apple, jackfruit – any fruit can be used to make jelly.

Ingredients :

Fruit extract – 1 cup

Sugar $\frac{3}{4}$ cups (this depends on volume of fruit extract).

A pinch of citric acid or one spoon lime juice

A little spirit to do the pectin test

Food colour if needed.

Method :

1. Wash fruit thoroughly, remove seeds, stem, dust etc.
2. Cut into large pieces, remove core.
3. Put in a thick bottomed vessel.
4. Add water just enough to cover fruit pieces.
5. Cook without stirring for 40–45 minutes on slow fire.
6. Watch to avoid burning, charring or scalding. Do not stir too much so that clear extract can be obtained.
7. After boiling for 45 minutes strain the cooked fruit mix, using a soft clean muslin cloth. Now you will get a clear liquid which is called fruit extract.

8. Test fruit extract for pectin content as follows :
Take a glass tumbler and put one spoon of extract into
Add two spoons of spirit to this
Now a precipitate will form, if it is a thick lump, it is
called a thick precipitate. If it is thin forming 2 or 3
lumps it is a thin precipitate.
 9. Measure fruit extract using a cup.
 10. Add sugar as follows :
3/4 cup sugar for one cup of fruit extract if the precipitate
thick
1/2 cup sugar for one cup of fruit extract if the precipitate
thin.
 11. Mix to dissolve the sugar and then filter once more.
 12. Keep on fire and cook / boil for 15–20 minutes till end point
is reached.
 13. After cooking for 15 minutes add citric acid (one tea spoon
for every kg. of sugar) and colour if needed.
 14. Test for end point as follows :
 - a) take a little jelly in a spoon, cool it and allow it to drop
If it falls like a sheet it is the end point.
 - b) take a spoon of jelly on a steel plate, allow it to cool.
The jelly should roll into a pearl like ball. Then it is the
end point.
 15. Remove from fire when end point is reached and bottle in
glass jars.
- N. B:* No preservative is needed for jelly.
No citric acid is needed for wood apple jelly.



FRUIT CHEESE

Any pulpy, fleshy fruit such as Papaya, Guava, Jack fruit, Mango, Banana or Apple can be made into cheese.

Ingredients :

Fruit pulp	1 kg.
Sugar	1 kg.
Butter or Fat	200 gms.
Citric acid	2 gms. or $\frac{1}{4}$ tea spoon
Salt	1 tea spoon or 5 gms.
Any food colour	A pinch
Cardamom powder	1 spoon

Method :

1. Wash and peel fruit, remove stem, seeds and core; cut into pieces.
2. Add a little water and cook till fruit is soft. Mash and seive to obtain pulp.
3. Add sugar at 1 : 1 proportion to pulp mix.
4. Cook till mixture starts spurting and splashing. Then start adding fat a little by little.
5. Before the last spoon of fat is added put in citric acid and salt.
6. Continue cooking till mixture leaves the sides of the vessel. or drop a spoon-ful on a steel plate and see if it hardens.
7. After it is well cooked mix cardamom and pour the mixture on to a greased tray.
8. Allow to cool and cut into pieces. If needed sprinkle nuts etc. on top.



FRUIT JAM

Any fruit can be made into a jam. Take firm ripe aromatic fruits, Remove peel, core, seeds and pips.

1. Cook fruit (cut into pieces) with a little water for 5 minutes.
2. Mash well and seive to extract pulp.
3. To one kg. of pulp add 1 kg. sugar and boil till bubbles are formed at corners and sides of vessel.
4. Add colour and citric acid (2 gms / kg).
5. Drop some jam in a cup of cold water; if the jam does not disintegrate it is ready.
6. Remove from fire, add a pinch of preservative, mix and bottle.



ORANGE MARMALADE

All citrus fruits can be used.

Ingredients :

Santra, Mosumbi	} To give 1 kg. pulp.
Grape fruit etc.	
Sugar	1 kg.
Lemon juice	1 lime.
No preservative is needed.	

Method :

1. Take ripe aromatic fruits. Wash well and cut into 4. Remove peel. Separate the segments and take out all seeds. Also remove the white matter, skin-like peel from inside the outer peel and around segments of sweet oranges, mosumbis.
2. Put all white matter, seeds into a small piece of white muslin cloth and tie into a bundle.
3. Cut peel into thin pieces. Cook them in water for 15 minutes changing the water 3 or 4 times. Keep cooked peel aside.
4. Crush citrus segments using a little water if needed. Put the bundle of white matter seeds into it and cook till soft pulp is formed.
5. Squeeze and take out bundle from pulp. Seive the pulp to remove any foreign matter.
6. Add equal volume of sugar to pulp and cook till the mixture drops like a thread from the ladle.
7. Add citric acid or lime juice and also cooked peel.
8. Cook for another 15 to 20 minutes till flake test is positive. For this dip a flat laddle in the syrup, lift out and hold it at a slant. If syrup drops from one point in a U-shape the flake test is positive. If syrup drops from many points, cook marmalade for some more time.
9. Bottle the marmalade; cover with stiff cloth and close lids. Remove cloth the next day. This removes moisture from bottles.



ORANGE SQUASH

Ingredients :

Orange fruit juice	1 cup
Sugar	1½ cups
Water	¾ level tea spoon
Preservative	KMS 1 pinch for 4 cups of finished product.

Method :

1. Take fully ripe oranges and extract juice.
 2. Strain to remove fibres, seeds and other bits.
 3. Take sugar, water and citric acid in required proportions and mix. Heat this on a slow fire and stir till sugar dissolves.
 4. Remove from fire and filter the syrup.
 5. Mix sugar syrup and fruit juice after cooling to room temperature.
 6. Add colour, essence etc. and also preservative. Fill in bottles and store.
- Squash can be prepared using any juicy fruit.

N. B : For lime squash a little more sugar and no citric acid is needed.

For Mango squash no colour or essence is needed.

For Grape juice sugar is in the proportion 1 : 1. Tonovin colour has to be added.



TOMATO JAM

Tomatoes	2 or 2½ kgs. to get 6 tumblers of pulp.
Sugar	3 tumblers
Citric acid	2 tea spoons.
Salt	a pinch

Method :

1. Take ripe tomatoes remove all green portions
2. Crush and cook on a pan for few minutes
3. Strain to remove skin and seeds
4. Mix salt, sugar, citric acid and juice
5. Cook stirring continuously till jam leaves the sides of the vessel.



PINEAPPLE PRESERVE

Ingredients :

Cut pineapple pieces	2 cups
Water	4 or 5 cups
Sugar	2 cups

Method :

Cut Pineapple into small pieces or slices. Take a thick bottomed vessel and cook the pieces in the vessel using water. When pieces are ¾ cooked, add sugar and stir slowly till all is dissolved and sugar syrup starts thickening. Remove from fire. Cool and then bottle.



JACKFRUIT PRESERVE

Ingredients :

Jack fruit pieces finely cut pieces 3 or 4 cups
Jaggery powdered to give 2 cups

Method :

1. Cut the fruit into fine pieces
2. Cook on a slow fire using a little water till all fruit is tender
3. Mash the fruit to form a pulp
4. Add jaggery and continue to cook till it forms a toffee like consistency.

P.S: This preserve can be eaten like jams

It can be made into Payasam by adding milk extracted from coconut and cooking; or it can be made into stuffed dosa, samosa etc.,

This preserve will stay unspoil even for 1 year.

AVVAKKAI MANGO

Ingredients :

Green Mangoes	15 medium sized
with good firm	
flesh and sourness	
Salt	4 00–500 gms.
Red chilli powder	300 gms.
Turmeric powder	100 gms.
Mustard powder	150 gms.
Oil	1 litre.
Kabuli Channa gram	2 tablespoons
Fenugreek seeds	2 tablespoons

Method :

1. Cut Mangoes into 8 or 6 pieces each using a sharp knife, each piece should retain a portion of the seed kernal coat. But seed kernals should be removed.
2. Wipe each Mango piece with a cloth to remove dust etc., If water had been used, dry pieces in the sun for one or 2 hours, keep aside.
3. Mix salt, chillie, turmeric and mustard powders together.
4. Take about 10 to 15 pieces of the Mango in a small vessal, add some spice powder (enough to coat all the pieces) Channa and Fenugreekseeds, mix.
5. Place this mixed Mango in the pickle jar and top it with 2 or 3 tablespoons of oil.
6. Repeat as in step 4 and 5 till jars is full and all ingredients are used up.
7. Pour about 3 or 4 cups of oil on the pickle sprinkle a little Mustard powder on top as a final layer.
8. Close jar tightly after covering the mouth with a piece of cloth.
9. After a week, open the jar and give it a good shake.
10. This pickle will stay preserved for more than a year, if it is prepared without being touched by hands or moisture.

Note : Roughly volume of mixed spice powders should equal the volume of cut mango pieces.



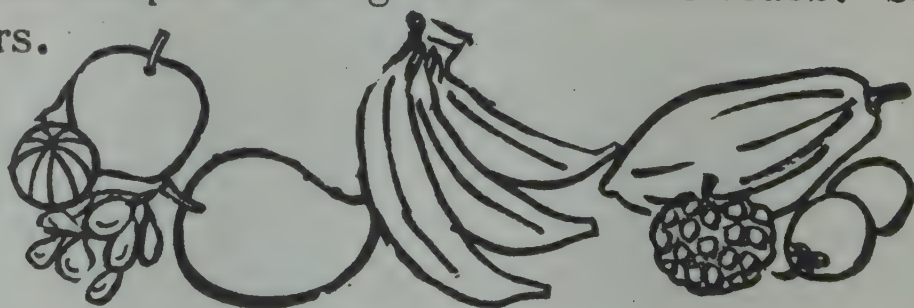
MANGO PICKLE-THOKKU

Ingredients :

Mangoes, sour and green	6
Salt	1 cup (more salt if fruit is so
Red chilli powder	3/4 cup
Turmeric powder	2 teaspoons
Mustard seeds	2 teaspoons
Fenugreek seeds	1 teaspoon
Asafoetida	1 piece
Oil	2 cups

Method :

1. Peel the Mangoes, remove skin and stone and scrape on a carrot scrapper.
2. Mix the Mango scrappings and salt in a vessal by shaking it (do not use laddle or fingers) keep aside for 3 days.
3. On the 3rd day a salt precipitate will be formed at the bottom of the vessal.
4. Separate the salt solution and the Mango into two trays and dry in the hot sun for one or two days.
5. Dry roast 1 spoon of mustard seeds and all the fenugreek seeds and powder it. Fry asafoetida piece in oil and powder it.
6. Heat oil, add mustard seeds and allow to splutter.
7. Add the Mango scrappings and all the spice powders and fry till the pickle stops sticking to the vessal sides. Store in air-tight jars.



LIME PICKLE

Ingredients:

Lime	15 medium sized
Salt	1 cup
Mustard seeds	$\frac{1}{2}$ spoon
Fenugreek or Methi seeds	$\frac{1}{2}$ spoon
Asafoetida	1 small piece (powdered)
Red chilli powder	$\frac{1}{2}$ cup
Oil	1 large tablespoon or more

Method :

1. Cut lime into 6 pieces each
2. Pour salt over the lime pieces and mix well just by shaking the vessel. (do not use laddles or hands)
3. Mix like this daily for about 10 or 15 days and keep aside till the pieces are well soaked.
4. Roast fenugreek seeds on a dry metal fry pan and powder.
5. Heat the oil, let mustard seeds splutter, add asafoetida
6. Remove from fire, immediately add chilli powder and fry a little
7. Add all the powders / spices to the salt soaked lime and mix (as in 2)
8. Store in clean pickle jars.

Note : If lime is very sour the quantities of chillie powder and salt can be increased.

BANANA SWEET-FRITTERS

Ingredients :

Unripe or Raw Banana	2 big sized
Dry ginger powder	1 spoon
Jeera powder	1 spoon
Jaggery (powdered)	1 heaped tablespoon
Oil	for frying.

Method :

1. Soak Raw Banana in water for a few hours. Then peel to remove skin.
2. Cut into fairly thick pieces.
3. Fry Banana in oil to get golden brown chips.
4. Take jaggery and a spoonful of water in a pan and prepare syrup on a slow fire. Seive syrup to remove dust sand etc.
5. Cook syrup and when it starts thickening add ginger and jeera powders and also mix in the banana pieces.
6. Keep mixing for a few minutes till fritters form into well coated pieces.

Note : These fritters are usually made using Nendran variety Banana and coconut oil.



TOMATO KETCHUP

Ingredients :

Ripe , juicy Tomatoes	about 1 $\frac{1}{4}$ kg. to give 1 litre juice
Sugar	100 gms.
Salt	10 gms.
Vinegar	50 ml.
Preservative	a pinch.

For the Spice bundle :

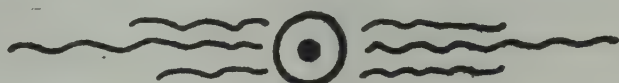
Onions	2 big
Garlic	2 pods
Pepper	8-10 corns
Jeera	$\frac{1}{2}$ flat teaspoon
Cardamom	5 or 6
Mace	a little
Cinnamon bark	2 pieces
Red Chillie powder	$\frac{1}{2}$ teaspoon

Method :

1. Take ripe red Tomatoes. Wash and cut to remove green or bruised portions.
2. Put in a thick bottomed vessel and cook for about 10 minutes till the skins start curling. Do not add any water
3. Remove from fire. Churn and strain to remove seeds and skin. Obtain about 1 litre juice.
4. Cut Onions and Garlic into fine pieces. Smash the spices slightly. Put them into a piece of thin muslin cloth and tie it up into a firm bundle and drop it into juice..
5. Add about 30 gms. of sugar to the juice and cook till volume is reduced to less than half. Leave the spice bundle in the juice as it is cooking.

6. Add remaining sugar and salt. Cook further till juice thick to sauce consistency.
7. Add vinegar.
8. Remove from fire. Take out spice bundle. Mix in the preservative and bottle in airtight jars.

Note : Ketchup can be prepared with Ripe Papaya or Pumpkin also, but a souring agent also has to be added.



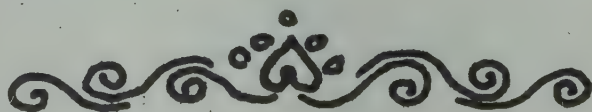
PAPAYA HALWA

Ingredients :

Ripe Papaya	1 small sized
Sugar	200 gms
Milk	2 cups
Ghee or Fat	1 tablespoon
Cardamom	2 pods
Raisins	a few
Kesar powder	a pinch

Method :

1. Cut Papaya. Remove all seeds and scrape on a coconut scraper to obtain fine pieces.
2. Drain away all moisture from the fruit by squeezing or dripping in a cloth bundle.
3. Heat fat in a pan and put in the fruit. Fry slightly.
4. Add Milk and Kesar powder and cook.
5. When the fruit is well cooked add Sugar and cook till halwa thickens.
6. Remove from fire, mix the Cardamom powder, raisins.

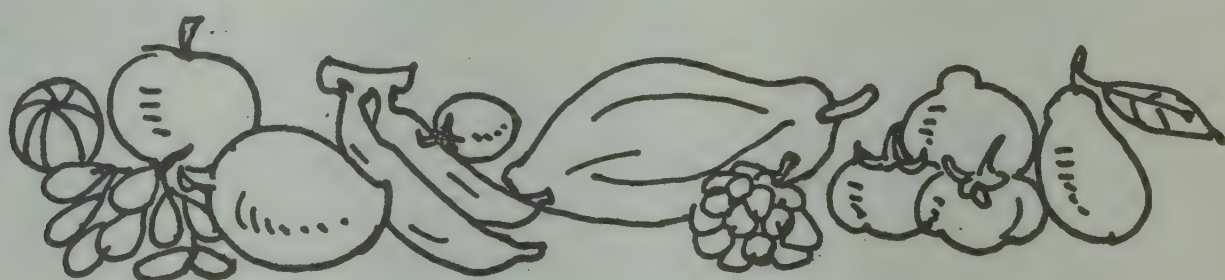


SEASONAL AVAILABILITY OF FRUITS

JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
PAPAYA											
BANANA											
APPLE											
PAPAYA											
BANANA											
AMLA											
SAPOTA											
AMLA											
SAPOTA											
PAPAYA											
GRAPES											
GUAVA											
ROSE APPLE											
LEMON											
JACK FRUIT											
GRAPE FRUIT											
GRAPE FRUIT											
JAMUN											
SEETAPHAL											
MANGOES											
MELONS											
ORANGE											
LIME (NIMBU)											
PINEAPPLE											
PINEAPPLE											

TRACE MINERALS IN FRUITS

<i>Fruit</i> <i>100 g.</i>	<i>Magne -</i> <i>sium</i> <i>(mg)</i>	<i>Sodi -</i> <i>um</i> <i>(mg)</i>	<i>Pota -</i> <i>ssium</i> <i>(mg)</i>	<i>Copp -</i> <i>er</i> <i>(mg)</i>	<i>Sul -</i> <i>phur</i> <i>(mg)</i>	<i>Chlorine</i> <i>(mg)</i>
Apple	7	28.0	75	0.13	7	1
Amla	—	5.0	225	0.18	—	—
Banana	34	36.6	88	0.4	7	8
Guava	8	5.5	91	0.34	14	4
Jackfruit	27	41.1	191	0.23	69	9
Jamun	35	26.2	55	0.23	13	8
Lemon	—	—	270	0.16	—	—
Mosambi	—	—	490	0.17	—	—
Mango	27	26	205	0.20	17	3
Musk Melon	31	104.6	341	0.03	32	80
Water Melon	13	27.3	160	0.05	42	21
Orange	9	4.5	93	0.58	7	5
Papaya	11	6	69	0.2	13	11
Pineapple	20	34.7	37	0.36	20	13
Roseapple	4	34.1	50	0.01	13	4
Sapota	26	5.9	269	0.36	17	26
Sitaphal	48	—	340	0.52	—	37
Tomato	12	12.9	146	0.14	11	6



OXALIC ACID CONTENT OF FRUITS

<i>Fruits</i>	<i>mg/100 gms.</i>	<i>Fruits</i>	<i>mg/100 gms.</i>
Apples	10	Musk Melon	2
Amla	296	Water Melon	11
Guava	14	Orange	10
Jackfruit	27	Papaya	1
Jamun	89	Pineapple	5
Mango	26	Sitaphal	30
Tomato	4		

SUGAR CONTENT OF SOME FRUITS

<i>Fruit</i>	<i>Glucose</i> %	<i>Fructose</i> %	<i>Sucrose</i> %
Apple	1.7	6.08	3.62
Banana	5.82	3.78	6.58
Gooseberry	4.40	4.10	0.71
Grapes (black)	8.2	7.28	0
Grapes (green)	8.1	8.01	0
Grapefruit	1.95	1.24	2.14
Lemon	0.52	0.92	0.18
Musk Melon	1.16	0.83	3.26
Orange	2.36	2.38	4.70
Pineapple	2.32	1.42	7.89
Tomato	1.63	1.17	0.

Varieties suitable for India

<i>Mango</i>	Dasheri, Rasपुरi, Alfonso, Langra, Chausa Beneshan, Rasalu, Totapuri.
<i>Banana</i>	Robusta, Dwarf cavendish, Rasbala, Nendra
<i>Guava</i>	Allahabad safeda, Lucknow 49
<i>Papaya</i>	Coorg, Honeydew, Col, Barwani yellow or Barwani Red, Kothri
<i>Grapes</i>	Thompson seedless, Anabe shahi Black champa, Beauty seedless
<i>Sapota</i>	Cricket ball
<i>Mandarin</i>	Coorg, Nagपुरi, Kinnow, Khasi.
<i>Jaman</i>	Any local variety
<i>Grapefruit</i>	Marsh seedless, Duncan, Excelsior Waters Foster.
<i>Lime</i>	Kagzhi, Seedless.
<i>Sitaphal</i>	Local.
<i>Jackfruit</i>	Singapore.
<i>Pineapple</i>	Kew, Queen.
<i>Tomato</i>	Pusa Ruby, Sioux, Punjab Chhaura, Roma Fire ball.
<i>Water Melon</i>	Sugar Baby, Arka Manik.
<i>Musk Melon</i>	Arka Jeet, Pusa Sarbati, Arkha Rajhans.

For further information regarding cultivation, propogation etc., the following addresses can be contacted :

1. Director, Indian Institute of Horticulture Research, I.C.A.R. 255, Upper Palace Orchards, Bangalore — 560 006.
2. Krishi Vigyan Kendras of ICAR in different states.

